Feb. 1930

# Electrical Manufacturing

Vol. 5 A Gage Publication No. 2

# This NEW clear Thinking--Hard Fast--In New Directions

MAR 3

## It's Here — Right Now — Everywhere
## Sweeping into Every Industry

Something is happening—Headed "Upward."
Moving Faster—Spreading Deeper.
Permanent—Nothing can stop it now.

### Industry's Next Great Stage is Starting

THE new prosperity, now preparing, will be based on new thinking, new ways, new thoroughness. New conditions are ahead of us. Some are here now. Production-thinking and equipment-thinking are sharper, faster, more complete. And with a stronger will to mesh perfectly with *every* aim and problem of business.

* * *

Just the hint of a business dip was enough. Even if it is over by the time you read this, the fast, keen, fresh thinking that it started is going on. It is getting more momentum. Its results in business and industry will be permanent. The new direction of industry's advance is being determined right now.

Already you feel it everywhere. Nothing escapes the sharp scrutiny of this new thinking. Methods, materials, equipment, designs, models, old ways, old slots, old neglects of opportunities, old "leech wastes"; all are in the crucible now.

From top to bottom in industry the best thought of all workers is being enlisted by executives.

* * *

The Fact-Sheets of Industry aim to help the scope and thoroughness of the new thinking, by supplying it with practical material; facts that every executive and every worker may find useful now. Facts no worker can do without, if he looks ahead and wants to be in step with his company's new aims and efforts.

* * *

The publication of this, the first of the Fact-Sheets of Industry, is the start of a plan which, when at its full growth, will supply freely to thinking workers in ALL levels of industry, practical knowledge which hitherto has not been readily accessible; facts from many other industries which may stimulate their own productive thinking; and which (though they affect practically every business, every department and every worker), are usually known only in part and only by a limited group of specialists in each industry.

* * *

As a movement in line with national measures for further improvement of business conditions and of the circuit of producing, earning, consuming, equipping, etc.;—and as the initial step in this democratizing of inter-industry knowledge (which, under present conditions, is more needed by thinking workers, and can yield more important results than ever before);—all expenses of issuing the first of the Fact-Sheets of Industry are being borne by The National Vulcanized Fibre Company and its various divisions and associated industries.

**NVF**

Write NOW. There is no charge. First of FACT-SHEETS of INDUSTRY, now in preparation, will be mailed free to ANY Worker, any Executive, if quick.

State work you do, your company's product or business; and whether request is for self. Address: Librarian Q-2, National Vulcanized Fibre Company, Wilmington, Del. (Card will do.)

NATIONAL VULCANIZED FIBRE COMPANY

# "Beldenamel has been a Major Factor in our Low Costs for 1929"

Beldenamel and Textile Insulated Magnet Wire, Coil Windings, Speaker Cords and Lead Wire are some of the products furnished to the Valley Electric by Belden

VALLEY APPLIANCES, INC.
ELECTRICAL EQUIPMENT
P O BOX 105
ROCHESTER, N.Y.
January 8, 1930

Mr. Whipple Jacobs
Belden Manufacturing Co.
23rd & Western Avenue
Chicago, Ill.

Dear Mr. Jacobs:

We cannot refrain from writing again to congratulate you on the exceptional uniformity and quality of Beldenamel wire furnished us during the past year. It has been a major factor in our low costs for 1929.

Also, we appreciate your not sacrificing quality to the tremendous demand of last season for magnet wire. It was this fact which helped us so much in getting over the peak period of the radio industry.

The next time you are in the East, suggest that you stop in to talk about next season's business.

Yours very truly,

W S Symington

President.

writes Stewart Symington, President of Valley Appliances, Inc. The accompanying letter tells the story.

This letter not only justifies the Belden password *"The Quality and Uniformity of Beldenamel Must Be Maintained"* but it is significant evidence that the correct way to figure enameled magnet wire costs is not price per pound on the spool but the cost in the finished product after rejections have been discarded.

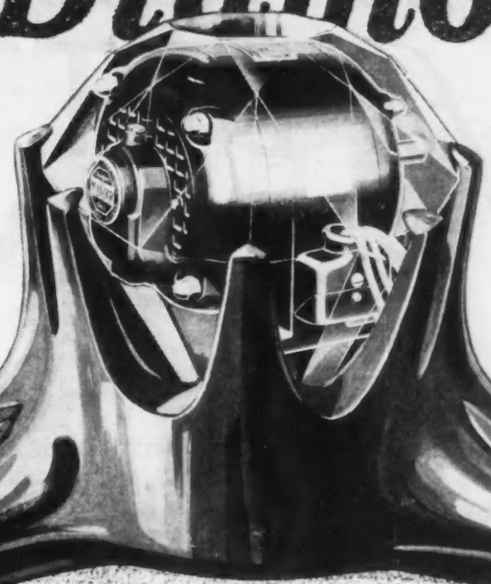
Like Valley Appliances, Inc., many other manufacturers have found the consistent quality and uniformity of Beldenamel a vital factor in low cost of high quality products. Other outstanding examples gladly furnished upon request.

BELDEN MANUFACTURING COMPANY
4633 W. Van Buren Street, Chicago, Illinois

# Belden

**Beldenamel and Textile Magnet Wire · Bakelite Moldings · Coil Windings · Automotive Wires and Cables · Airplane Assemblies · Radio Wires, Cords and Cables · Rubber Covered Wires · Armored Cables · Flexible Armature Wires · Motor Lead Wires · Braided and Stranded Copper Cables · Cotton Sleeving**

# A POWER Diamond!



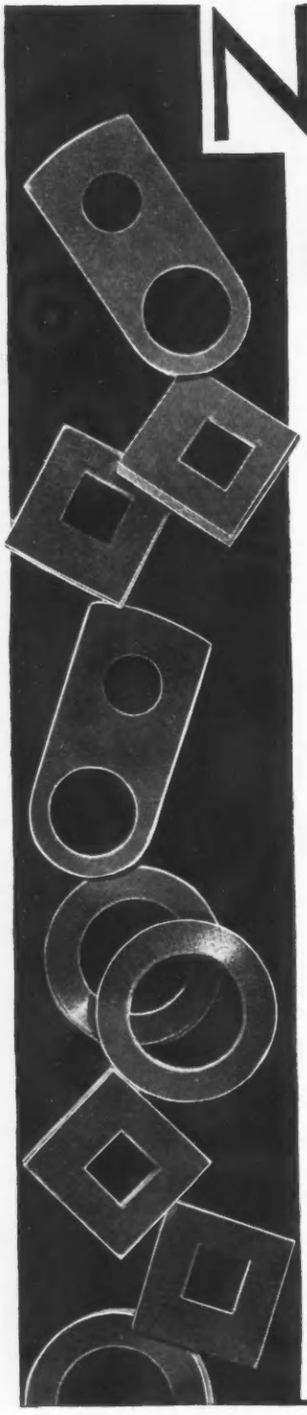
It's a MASTER

THE diamond . . . a gem whose fiery brilliance makes it seem to live in its setting . . . aptly symbolizes the high quality of Master Guaranteed Motors ...motors that give life and power to the appliance or machine which they drive.

Perfection of design; the absence of flaws; the utmost durability...these constitute the true value in Master Motors as they do in the diamond itself. Master Motors have come to be called "Power Diamonds", to express their *known* quality, their dependable and brilliant performance.

THE MASTER ELECTRIC COMPANY
DAYTON, OHIO

STOCKS CARRIED IN PRINCIPAL CITIES
MORE THAN 100 SERVICE STATIONS
MASTER GUARANTEED MOTORS
1/20 TO 10 H.P. Dayton THE MASTER ELECTRIC CO. Ohio Not More Than 40°



# NEW *Equipment and Resources* »» *for* BETTER SERVICE •

FORMICA constantly adds to its equipment and resources to provide better service for the electrical and radio trade.

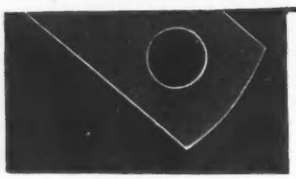
During the past year, over 50,000 feet of floor space was added to the Formica factory. Many new machines have been installed including a very much longer sheet press.

This equipment is located near the center of industry where quick deliveries can be made to manufacturers everywhere over the shortest average haul.

*Send your blue prints for quotations on fabricated parts*

THE FORMICA INSULATION COMPANY
4626 Spring Grove Avenue CINCINNATI, OHIO

• FORMICA •



# Electrical Manufacturing

*Reg. U. S. Patent Office*

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ELECTRICAL MANUFACTURING'S editorial program has the following objectives:

### Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

### Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

### Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

### Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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# To all Users of a New Process

(Patent Applied For)

*to announce—*

An asbestos insulated magnet wire [Pat'd 1928] with a uniform diameter no greater than double cotton covered magnet wire – sizes 15 B&S gauge and smaller – at a price much lower than heretofore

ROCK

*—the Wire with*

# Magnet Wire enables ROCKBESTOS

To users of cotton covered magnet wire, this means a method of building longer life, continuous service and general reliability into your product—without redesigning.

To present users of asbestos covered magnet wire in this range of sizes, lower prices mean a reduction in the cost of your product. They also permit the wider use of asbestos insulated magnet wire.

Clip the coupon below for the complete details, sample, and quotation.

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365 Nicoll Street
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942 Grand Central Term. Bldg., New York 903 Clark Bldg., Pittsburgh, Pa. 224 Madison Term. Bldg., Chicago
2143 Railway Exchange Bldg., St. Louis, Mo.
On the Pacific Coast—Anaconda Wire & Cable Co.

ROCKBESTOS
*Permanent Insulation*

CUT THIS COUPON OUT and MAIL TODAY

Rockbestos Products Corp.,
365 Nicoll St.,
New Haven, Conn.

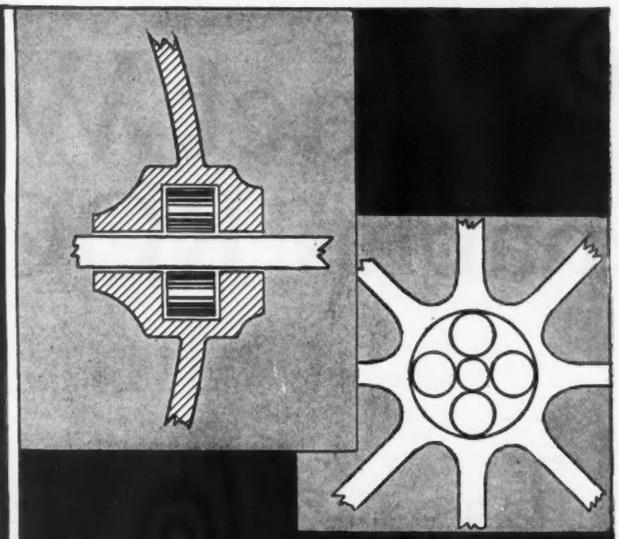
Send samples and complete information about your new Magnet Wire.

Name .....

Title .....

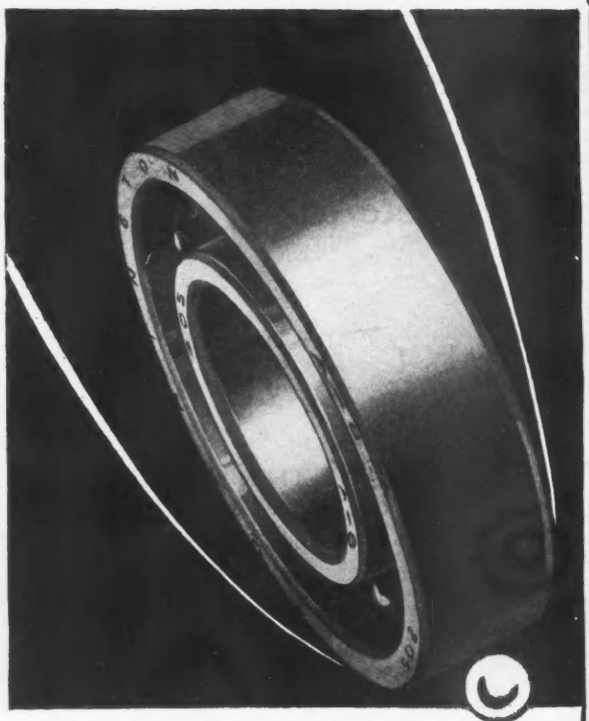
Firm .....

Address .....



In the middle of the 17th Century the operations of Louis the Fourteenth's military campaigns were hampered by the loss of horses. This inspired the idea of mounting cannon wheels on disk rollers, but there was a tendency of the wheels to wobble and there was an excessive amount of side friction. The perfect bearing had not been invented.

# The WORLD fights FRICTION



THE true rating of most machines are determined by their performance under peak loads. Torrington Ball Bearings, by eliminating friction, are an important factor in establishing efficiency.

The fact that Torringtons are made by specialists in precision manufacture—from specially hardened steel, and to very close tolerances—accounts for their reliable performance.

Torrington Ball Bearings may be depended upon to give the service that builds good will for the machine and the maker.

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S. W. ANDERSON
556 W. Washington Blvd.
Chicago, Ill.

The
TORRINGTON COMPANY
*Curtis Building*
2842 W. Grand Boulevard
Detroit, Mich.

*The Torrington Company*
ESTABLISHED 1866
*Torrington, Conn., U.S.A.*

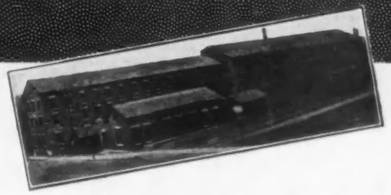
**THE** matter of moulding **accurately** many things for all industries doesn't bother Scranton Button experts . . . as for the electrical industry, Scranton Button has been serving it consistently since the very dawn of that industry.

**The SCRANTON BUTTON COMPANY**

# SCRANTON

*The world's largest and newest-equipped moulding plants*

*Main offices and Plant, Scranton, Pa.*



*Auburn Plant, Auburn, New York*

**NEW YORK, N. Y.**
**50 Union Square**

**DETROIT, MICH.**
**114 East Lawn Ave.**

**CLEVELAND, O.**
**4900 Euclid Bldg.**

**CHICAGO, ILL.**
**645 Washington Blvd.**

# SPIKE TROUBLE

before it starts

TOUGH — HARD
HEAT RESISTING
CONNECTOR PLUGS

by

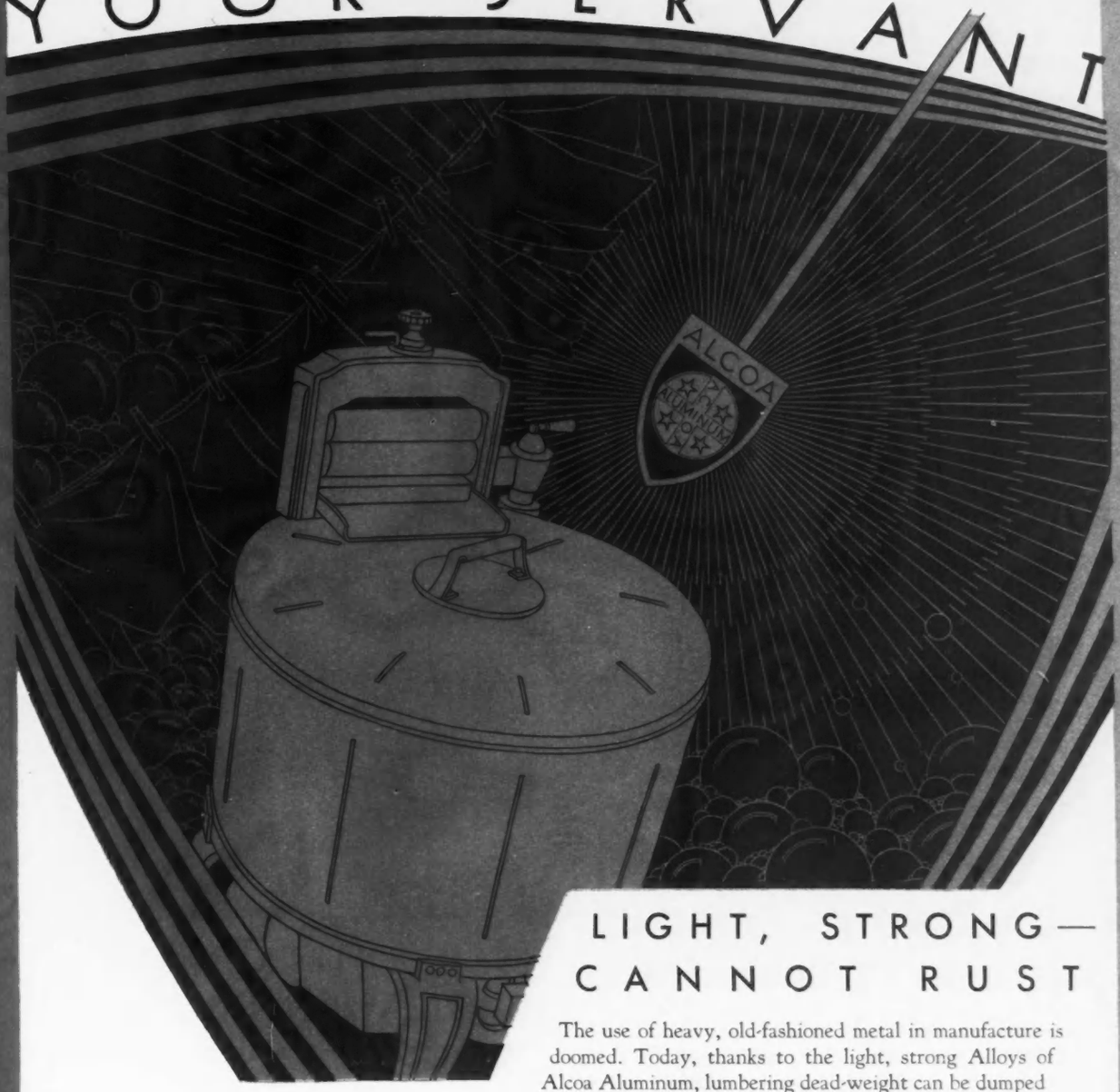
**BOOKLET 105**
graphically describes the process of cold molding, and tells why GUMMON is the choice of many discriminating manufacturers.
**SEND FOR IT**

Using
## GUMMON
COLD MOLDED INSULATION

*Manufactured by*

## GARFIELD MANUFACTURING CO.
GARFIELD, N. J.

# YOUR SERVANT




## LIGHT, STRONG— CANNOT RUST

## IN MANUFACTURING

The use of heavy, old-fashioned metal in manufacture is doomed. Today, thanks to the light, strong Alloys of Alcoa Aluminum, lumbering dead-weight can be dumped over-board—can be replaced with Alcoa Aluminum weighing only 1/3 as much.

Pressed products of Alcoa Aluminum are easily fabricated, with high overall strength and no thin or weak spots. Forged parts of Alcoa Aluminum provide maximum lightness with maximum strength. When welded, joints are equivalent in strength to a continuous piece of solid metal.

It is a point of pride with Aluminum Company of America to have both developed and provided a dependable source of supply for Alcoa Aluminum Alloys; metals which are so eminently adapted to the fabrication of all electrical, household and industrial devices.

A representative will be glad to call and discuss the advantages of Alcoa Aluminum in its many forms in the manufacture of your product. ALUMINUM COMPANY of AMERICA; 2444 Oliver Building, PITTSBURGH, PENNSYLVANIA. Offices in 19 Principal American Cities.

# ALCOA ALUMINUM

ALCOA

# YOUR SERVANT

## BECAUSE IT COMBINES STRENGTH WITH LIGHTNESS

IN SELLING

Alcoa Aluminum extends a helping hand to your sales force. Today, through color pages in Good Housekeeping, Saturday Evening Post, Country Gentleman, millions of housewives are learning of the myriad ways in which far seeing manufacturers are using this modern metal in the fabrication of household aids and devices.

These consumers—your ultimate customers—are fully aware that because Aluminum is light, strong and cannot rust, it is the ideal metal from which to make washing machines, ironers, etc. They know, too, that because aluminum conducts heat 5 times faster than iron or steel, it has made the waffle grid and the electric hot plate possible.

Then, too, where washing machines, wringers or vacuum cleaners have been used as "demonstrators" their Alcoa Aluminum parts can be quickly and easily cleaned and polished to look like new.

Without any obligation on your part a representative will gladly tell you how Alcoa Aluminum can help you both in selling and manufacturing. ALUMINUM COMPANY *of* AMERICA; 2444 Oliver Building, PITTSBURGH, PENNSYLVANIA.
Offices in 19 Principal American Cities.

# ALCOA ALUMINUM

# When the wire is IN CONFERENCE

The president leaned back in his chair. "Jerry," he said, "why are you so strong for giving this whole wire contract to Dudlo?"

The G. M. stood up. "Well, I can think of three reasons. In the first place, our Dudlo wire has stood up under every test we have given it. Our business is built on accuracy, and we must take no chances on our wire. With Dudlo wire we get the quality our product demands. The second reason is uniformity . . . the last pound on our order is just as good as the first."

"And don't forget deliveries," broke in the purchasing agent, "Dudlo has by far the largest capacity in the industry today, and they can take care of our increased production schedule without holding us up."

"That's right," said the president," and what's your third reason, Jerry?"

"Our figures," replied the G. M., "show that our producton costs are actually reduced when we use Dudlo wire."

"Well," said the president, "I guess you've convinced me. This is the largest contract we ever placed, and I wanted to check up and make sure that we make no mistake. You've got my O.K. Go ahead."

# DUDLO

**DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA**

*Division of General Cable Corporation*

WHAT DO YOU DEMAND IN LAMINATED PRODUCTS?

*Textolite explosion chamber, 12 in. high, 14¼ in. diameter. Will withstand 1500-kv. and hydrostatic pressure of 925 lb. to sq. in.*

## *Do you demand* Great Mechanical Strength?

This explosion chamber for 220-kv. circuit breakers is fabricated in one piece—replacing a model of six parts of various materials. It is an outstanding example of the use of Textolite laminated in modern electric apparatus.

This piece exemplifies the remarkable mechanical and electrical properties of Textolite laminated. And it strikingly illustrates the skill acquired by G-E technicians in producing millions of pounds of Textolite laminated in the last seven years.

General Electric is prepared to furnish Textolite laminated in standard grades for all known uses, and to develop special grades for specific purposes. Consult the nearest General Electric office.

Eastern Distributor
General Fabricating Co.,
165 Greenwich St.,
New York City, N. Y.

Central Distributor
Electrical Insulation Corp.,
308 W. Washington St.,
Chicago, Ill.

GE Textolite Laminated

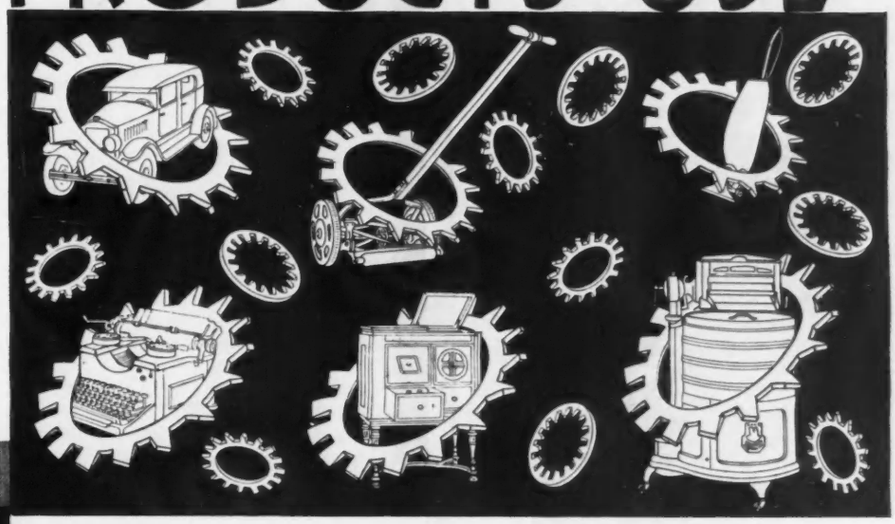
JOIN US IN THE GE[illegible]AL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 9 P.M., E.S.T. ON A NATION-WIDE N.B[illegible]ETWORK

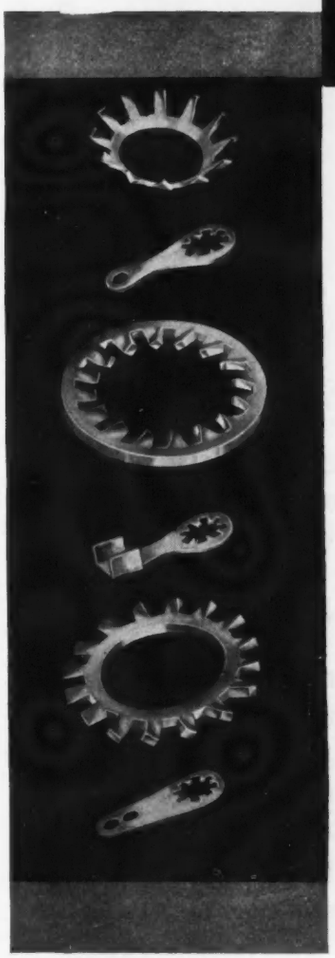
GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

35-24

# 101 PRODUCTS USE





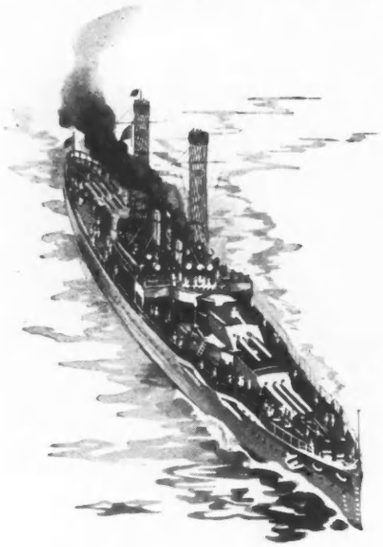
# SHAKEPROOF

ALL over the town—all over the country—on automobiles and electric refrigerators—on radio sets and vacuum cleaners—on machine tools and kitchen stoves—wherever there is a bolt to come loose—wherever there is a nut to lock—you will find SHAKEPROOF. Big manufacturers—medium sized manufacturers—small manufacturers alike are unanimous in their adoption of SHAKEPROOF, not only because they hold and won't let go, but because they speed up production, save on bolt lengths and cut costs as well. There is a place on your product for SHAKEPROOF. You are paying for SHAKEPROOF whether you are using them or not. Write for samples and prove this to your entire satisfaction.

**SHAKEPROOF**
***Lock Washer Company***
[ Division of Illinois Tool Works ]
**2513 North Keeler Avenue' Chicago, Illinois**

**WRITE FOR SAMPLES**

## WHERE UDYLITE BEAUTIFIES AND PROTECTS



## *How* UDYLITE *Protects Our* NATIONAL *Defense*

The navy is our first line of national defense and Udylite protects dozens of metal parts on its huge steel ships and speeding battleplanes. This guards them against salt spray, moist cloud banks and other exposure that would otherwise rust and corrode the metal.

Udylite RUST PROOFS

## *The Best Rust Resistant*

The Udylite process thoroughly protects metal parts on sea, land, or in the air, throughout the world. Wherever there is exposure and consequent danger from rust and corrosion, the Udylite process stands guard.

Udylite, first of all, brings a soft gray tone to the surface. Yet more important is the absolute protection it gives the metal underneath this surface beauty. This protection against rust and corrosion has been proved in the laboratory and the field. Under all kinds of severe conditions of exposure, the Udylite process guards and also beautifies vital metal parts at work around the world.

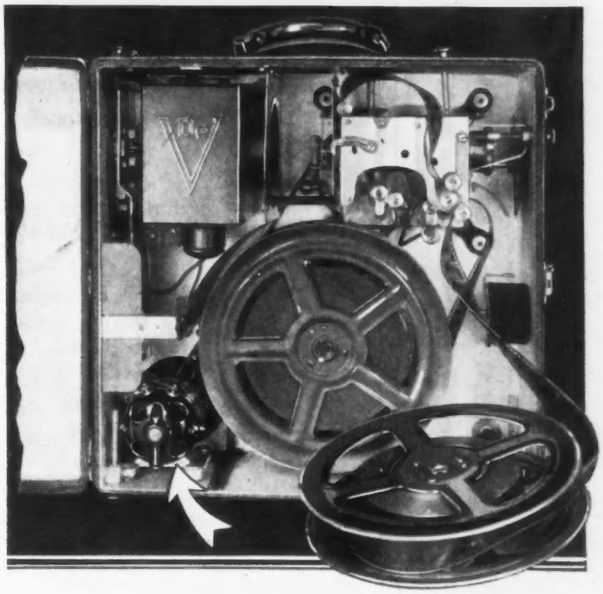
THE UDYLITE PROCESS COMPANY

*Eastern Sales Office:* 30 East 42nd St., New York

3220 Bellevue Avenue DETROIT, MICH.

*Western Sales Office:* 114 Sansome St., San Francisco, Cal.

# ▲ ▲ ▲ HOW BODINE MOTORS SERVE DeVRY PORTABLE MOVIE PROJECTORS



IN the land of eternal ice, MacMillan amazed his Eskimo friends with DeVry motion pictures of America. Explorers in the humid jungles of Africa have astounded bewildered natives with motion pictures of other lands. In the channels of commerce, in the airplane, in the club car, or on the sea, DeVry Projectors daily animate the silver screen.

Bodine Motors, in several models, have served DeVry Projectors for many years under extremes of temperature and moisture that would quickly reveal constructional defects. *"The steady operation of the DeVry Projector,"* says a DeVry bulletin, *"is in a great measure due to the motor. Small as it is, this motor is so strongly constructed that failure is a rare occurrence, and, if oiled, will run for years without any trouble."*

Such ruggedness is traditional with Bodine Motors. They are built up to a standard of uniform, high quality. For this reason you will find Bodine Motors wherever unfailing performance is expected.

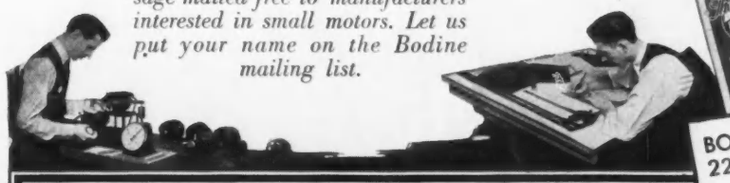
## WHAT IS YOUR MOTOR PROBLEM?

ARE you seeking a motor that is engineered for your product? Do you want a motor with maximum power in minimum space? Are you anxious to improve the performance of your motor-driven appliances? If so, let Bodine Engineers test your unit and engineer a motor to exactly meet your requirements.

The Bodine Line includes direct current, alternating current and universal motors; also converters, motor generators, dynamotors, low speed units and frequency changers, from 1/4 H.P. to 1/1300 H.P. and for almost any speed. Send for the Bodine Catalog.

This is one of the Bodine Motors used on DeVry Projectors

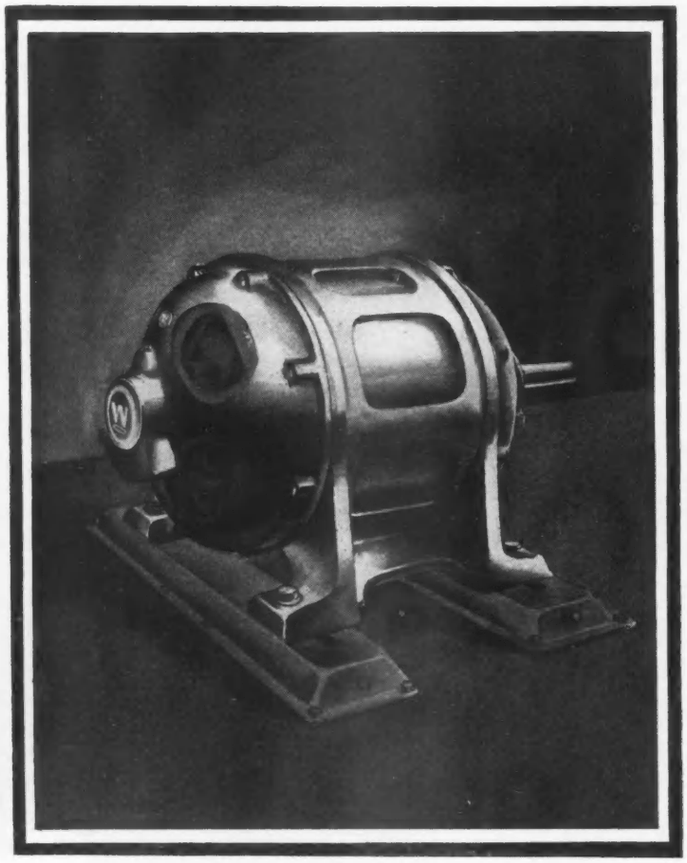
*The Motorgram is a bimonthly message mailed free to manufacturers interested in small motors. Let us put your name on the Bodine mailing list.*



**BODINE MOTORS**
ENGINEERED FOR YOUR PRODUCT

BODINE ELECTRIC CO.
2256 W. Ohio Street, Chicago
Please send items checked below:
☐ Bodine Catalog ☐ Motorgram
Name
Title
Address

# IS YOUR SELLING



*Are you getting this 7-fold service with the motors you use?*

. . .

1 Prestige of the electrical equipment to help reduce sales resistance.

2 Twenty-two thousand different styles, sizes and ratings of motors to select from, with control to match.

3 Service facilities in thirty-three strategically located centers to service the equipment you sell.

4 Motor specialists constantly available to help solve your motor application problems.

5 Engineering service available for co-operation in the design of your product for future or present needs.

6 Contacts in the field that give alert manufacturers new leads to business.

7 Advertising that helps broaden the field for electrically-driven machinery.

. . .

More than forty years' experience in the design and construction of motors for application to all types of motor-driven machines gives Westinghouse the skill and ability to establish and maintain balanced design and construction.

. . .

*Westinghouse variable voltage equipment on this Marion Shovel is designed for a specific job with a full knowledge of the requirements of the service.*

# EXPENSE

## "under the Guns"?

*The manufacturers of the products shown on this page—a few of the many using Westinghouse motor drives—are taking advantage of the 7-fold service offered by Westinghouse.*

PRODUCTION cost is not the only expense being scrutinized these days. Selling expense, also, is "under the guns" and has been found a fruitful field for economy.

If your salesmen ask their customers if they have heard of Westinghouse, they will get "yes" from ninety-nine per cent of their prospects.

This is not an accident—it is the result of the continued widespread Westinghouse advertising and publicity. And it is to be expected because Westinghouse is known everywhere as a pioneer in the design and manufacture of dependable electrical equipment.

And these "yeses" mean something to you. Your salesmen need not spend valuable time and energy when their customers ask about the electric drive.

". . . . and the electric drive?"

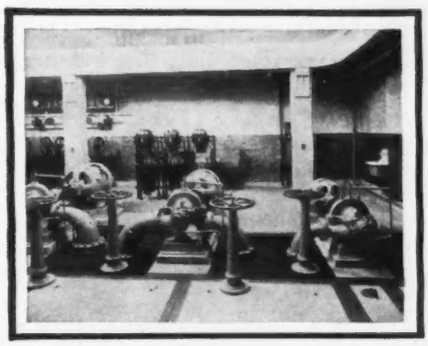
"By Westinghouse"

"O. K!"

And that's that.

. . .

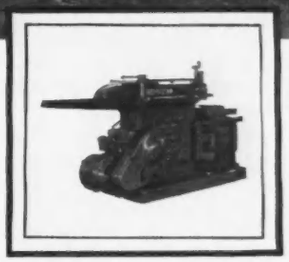
*Westinghouse motor drives on American Well Works Pumps in a municipal pumping station.*



*Above . . . Sterling vegetable peeler powered by a Westinghouse type AR motor. A Westinghouse Sentinel Breaker protects the motor against overloads, and serves also as a convenient starting switch.*

. . .

*At the right, a Cincinnati Shaper with complete Westinghouse electrical equipment.*



*Landis roll grinder powered by Westinghouse motors and control.*

. . .

*Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops*

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# GLOBAR NON-METALLIC ELECTRIC HEATING ELEMENTS

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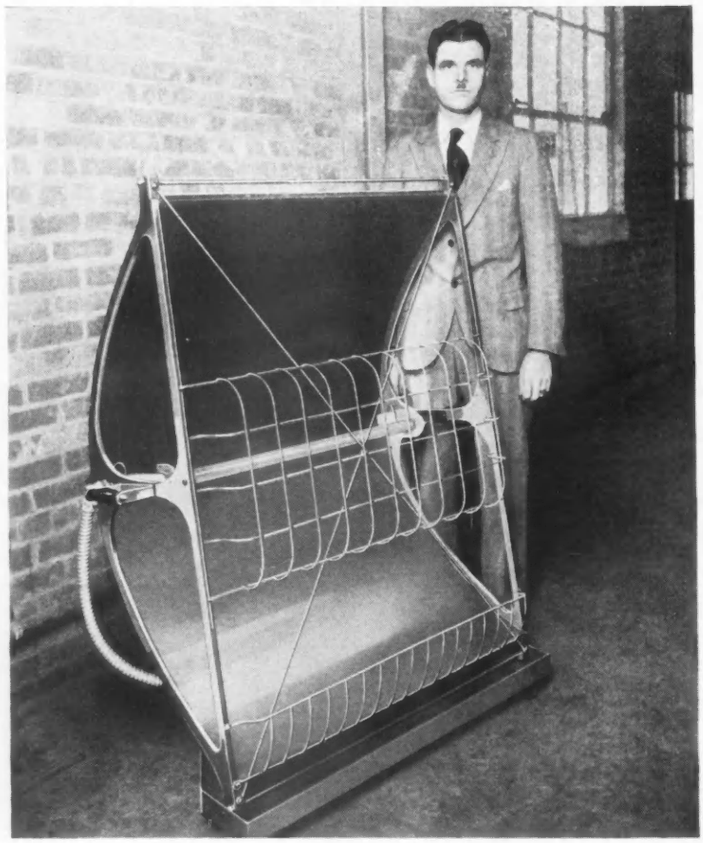

*And here is an Unusual Example*

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This is an interesting example of the application of radiant heat. Radiant heat follows the same laws as those of light. It does not warm the space through which it travels, but is instantly effective (as heat) when it is absorbed.

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## GLOBAR CORPORATION, NIAGARA FALLS, N. Y.

(A SUBSIDIARY OF THE CARBORUNDUM COMPANY)

WILLIAMS & WILSON, LTD., MONTREAL—TORONTO, CANADA STEINMETZ & COMPANY, PHILADELPHIA

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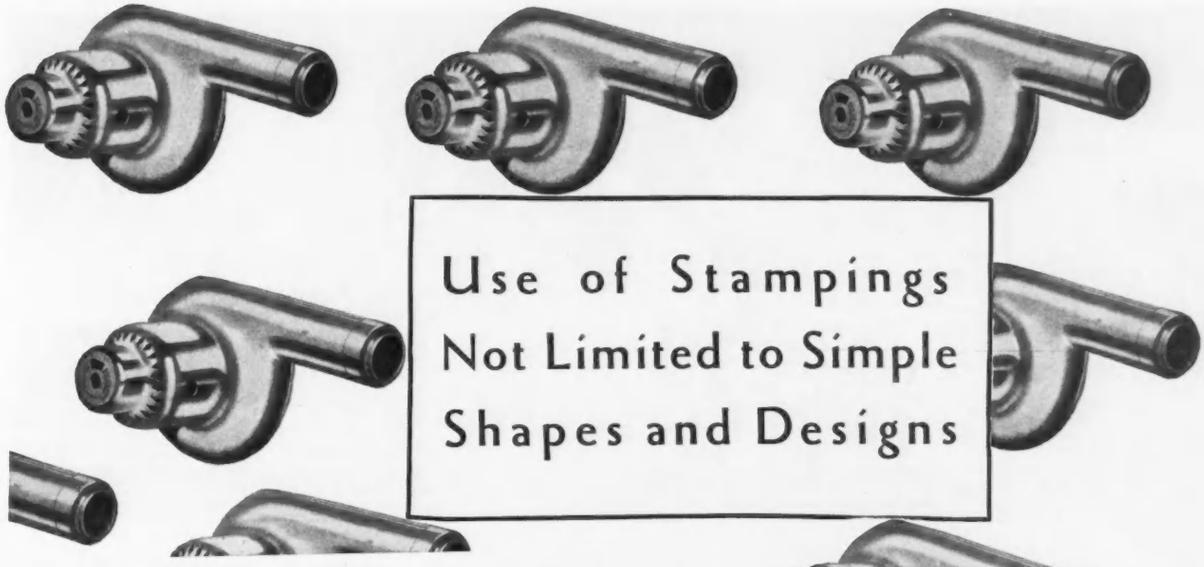
(Globar is the registered trade name given to non-metallic electrical heating and resistance materials, and to other products of Globar Corporation, and is its exclusive property.)



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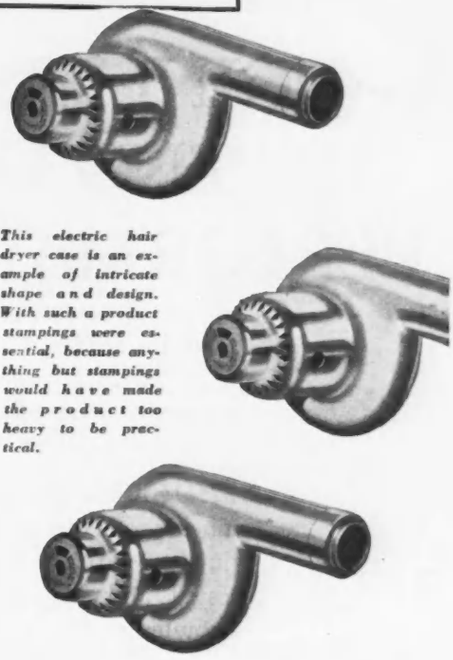

*This electric hair dryer case is an example of intricate shape and design. With such a product stampings were essential, because anything but stampings would have made the product too heavy to be practical.*

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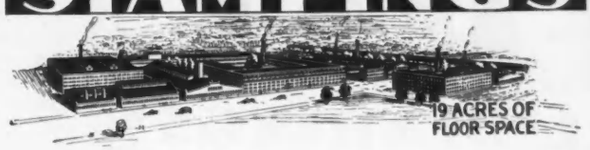


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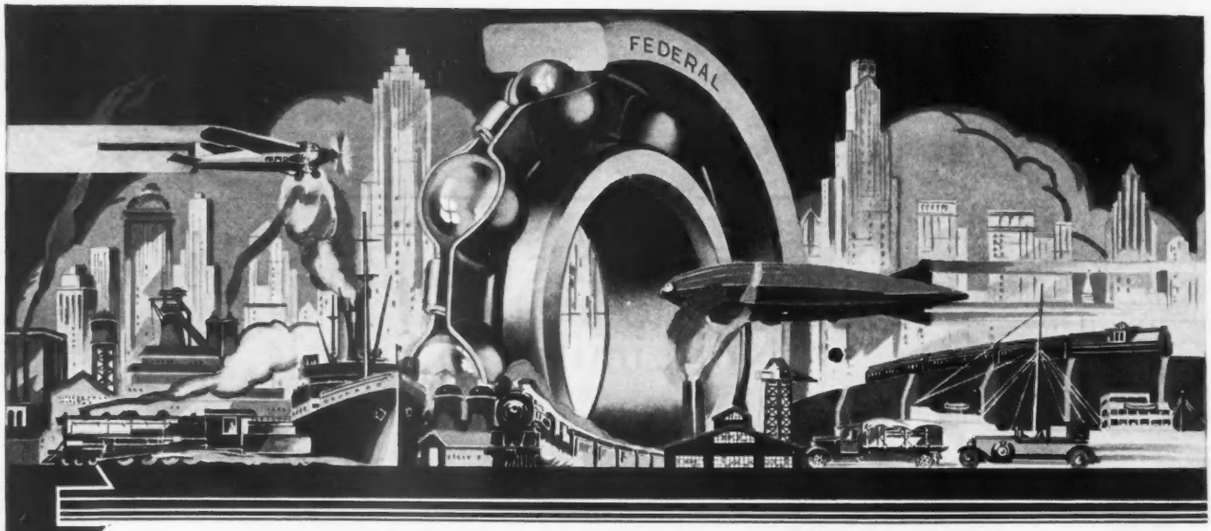


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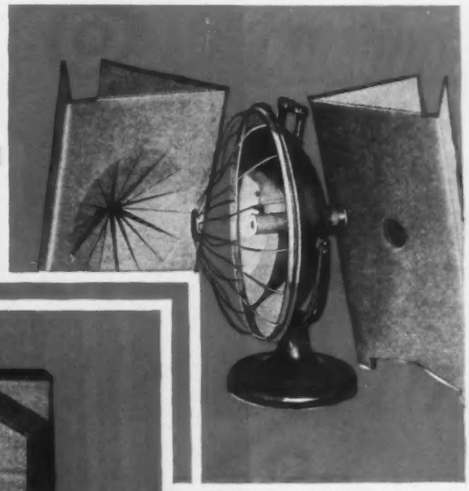

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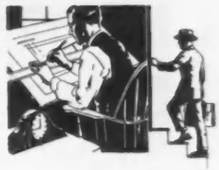

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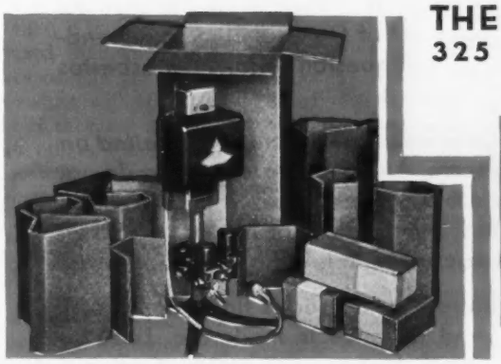

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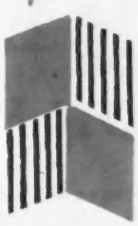

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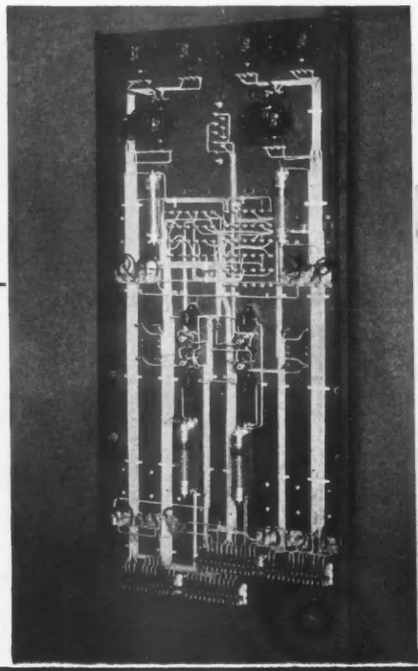
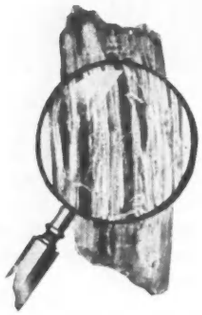


Baltimore Trust Co. Bldg.—Deltabeston Wired



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Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 5 FEBRUARY - 1930 Number 2

# Improved Inspection Methods Keep Pace With Production

By Chapin Hoskins

**THE actual work of manufacturing is one thing: the development and specification of manufacturing processes and methods is quite another. So it is with inspection itself and the devising of tests which the inspection department uses. Such is the case in the different plants of the Western Electric Company where there is the constant problem of developing new means and methods for keeping inspection practices in pace with changes and improvements in manufacturing operations and processes**

IN the making of electrical products, the greatest successes follow a clear recognition of the fact that the actual work of manufacturing is one thing, and the development and specification of manufacturing processes and methods are another. It is commonly recognized that executives and men responsible for turning out the product will do a better job of it if they are able to hand over to others the responsibility for prescribing how the work shall be done.

That in inspection and testing the same principle holds, is not so widely realized.

As a matter of fact, the determination of quality and serviceability of product through inspection and testing presents the same dual problem that manufacturing itself does. Inspection and testing must be done right, but they must also be done with the appropriate cost results. The problem is therefore precisely parallel to that of production.

In most plants the inspection department must devise the tests which the inspection department uses. But, exactly as a manufacturing department can get better results if all it has to do is to produce, so an inspection and testing department can get better quality-cost results if it has nothing to do but to inspect and to test.

While it is true that a small factory cannot always assign the development of inspection methods and the operation of these methods to different departments, there is reason to believe that a very considerable number of electrical plants which have so far failed to recognize the possibilities of this division of responsibilities could do so with profit.

Among the larger companies, Western Electric Company, with its two extensive plants at Hawthorne, Ill., and Kearny, N. J., and a third plant soon to be in operation near Baltimore, has clearly recognized this principle and put it into full effect in its divisions of organization responsibilities.

Along the side of one of the rooms of the Western Electric Company's plant at Kearny, N. J., there is a roller conveyor. On this conveyor stand P. B. X. switchboards in various stages of progressive assembly, and on both sides of the conveyor men are busily occupied with their own assembly tasks.

At intervals this conveyor has stubby switch tracks standing out at right angles from the main conveyor, each a switch large enough to accommodate a complete switchboard, with room enough for an inspector to move about while he makes his tests.

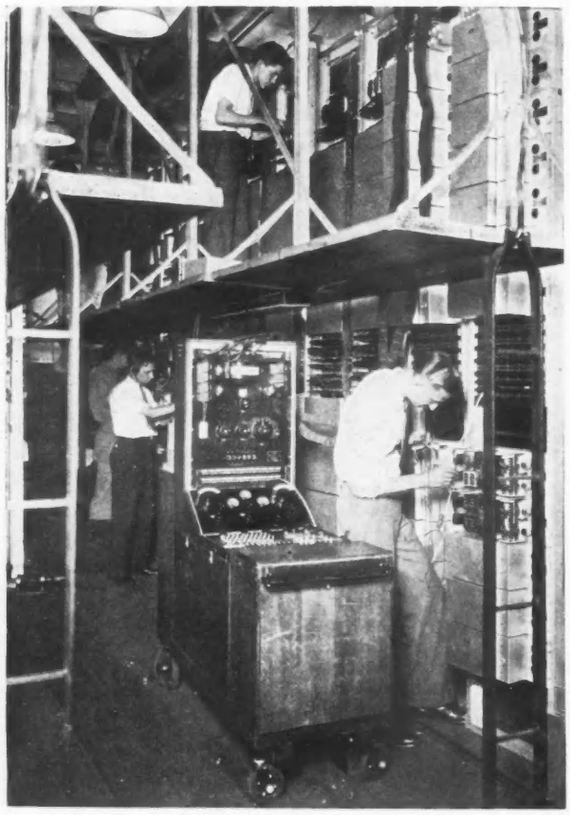
But here at the next switch is another inspector. Though he is doing the same work, his testing set is different. Among other things its box is new and shiny. And its newness and shininess are but one indication that this second testing set is a 1929 model, apparently as much an advance over the set previously used as a new model automobile is over its predecessor. This 1929 model is replacing the older model as fast as new sets can be made.

The difference between these two testing sets would interest any electrical manufacturer. But the point that should interest him more is the indication it and similar

developments elsewhere in the plant give that constant improvement is being made in the apparatus with which Western Electric tests its products.

This constant improvement is possible only because there is in each works a department the sole responsibility of which is to devise and install testing methods and apparatus.

Inspection, in each of Western Electric's plants, is the work of an inspection department responsible to the Works



*As new products are devised, older products improved, or manufacturing methods changed, the Western Electric Company changes its inspection and testing methods to meet these conditions. Above is one of the recent developments in what this company calls a "teawagon" test set*

Manager. This department has the final responsibility for quality in every case.

But, in getting this quality, the Inspection Department has the direct and constant assistance of another department, one which is not a part of the Works Manager's organization.

This other department is the Division of Inspection Development, a part of the organization headed by the Engineer of Manufacture.

Western Electric's Engineer of Manufacture is an executive directly responsible to the Vice-President of Manufacture, to whom each Works Manager also reports. Through his Superintendent of Manufacturing Development in each works, the Engineer of Manufacture develops equipment and processes for use by the Works Managers' Departments. Through his Superintendent of Manufacturing Planning, he provides for the flow of production. Through a Division of Assembly Development, he devises the special equipment and processes of progressive assembly.

Thus, the Engineer of Manufacture provides, the Works Manager uses, throughout all the work of production. If a new product is to be manufactured or an old one modified, it is the Engineer of Manufacture who sees that the problems of process, method and equipment are properly solved. On existing products, it is his responsibility to see that processes and methods are improved, whenever a justified money saving or a quality gain can be made.

Precisely the same relationship prevails in the work of quality determination. The establishment of methods for inspection and testing of new or modified products is but a part of the work of the Division of Inspection Development. Improvement of methods and equipment is made whenever and wherever a justified money saving or quality gain can be demonstrated.

The responsibility of the Inspection Development Division extends from all raw materials used in the plant to all finished products leaving it. Copper wire, cotton and paper for its insulation, chemicals with which the cotton yarns are dyed, lead and antimony with which cables are sheathed —all these have to be tested chemically and physically by the Works Manager's Inspection Department. But it is the engineers of the Inspection Development Division who devise the tests which are used. The same with semi-finished work, such as cables which have been stranded but not yet sheathed, and with finished products, whether cables, telephone instruments or switchboards. One department sets up the tests, the other administers them.

### Inspection Division Important

It is in the development of testing equipment that this specialized Inspection Development Division proves particularly valuable.

Testing equipment must be provided for two general classes of testing. There are items of raw material and apparatus which must be tested for their individual requirements, and then following the assembly and wiring of the final product, such as switchboards, there must be an overall test of the entire circuit. Each test set thus has a definite purpose and within the Inspection Department Division there are engineers specializing on these types.

Thus, in developing a new testing set like the "1929 model" already mentioned, the engineer in charge will work toward testing within closer limits and with even greater accuracy than before. He will at the same time aim for greater ruggedness, and particularly will seek to develop a set that may more easily be kept up to standard.

These matters of quality come first, but they are only the beginning.

Saving of inspection cost is important. So also is the effect which the test may have on production costs themselves. Saving of inspection cost may mean providing both for increased accuracy and for increased speed on the part of the test operator.

For instance, in testing the electrical characteristics of carrier telephone systems which make possible the transmission of several conversations simultaneously on a single pair of wires, it is necessary to make extremely accurate and detailed checks on all portions of the circuit. The old test set for this purpose employed several separate units placed on a 25-foot bench occupying some 110 square feet of floor space. The inspector had to walk back and forth along this bench to perform the test. A new set has replaced the old. Now the various units are mounted one above the other on a test rack, requiring only 3 square feet of floor space. The inspector has all test set controls as well as the carrier system itself within easy reach.

The old set was so designed that an individual battery supply was needed for each unit. As production demands called for additional test sets, this source of supply tended to become costly as well as inadequate. The new sets require no local batteries, but receive power directly from one centralized power plant. The resultant savings from this item alone have paid for the improvement.

With the old type of set many power and cross connections had to be made, resulting in a large number of soldering operations. Special contact fixtures are provided with

the new set, eliminating all soldering. This has shortened the test period by two days.

### Developing Test Sets

The old set offered many places for the accumulation of dust which tended to cause electrical troubles. There was no provision for instruction charts, and the exposed meters were subject to damage. The new set is very compact and well protected, the circuit is simplified, meter calibration charts and drawings are mounted under shatter-proof glass on a writing shelf attached to the rack itself.

While each of these points of difference may be rather small in itself, taken together they reduce the testing time considerably and also make the operation easier, which obviously will make for better testing. In the case mentioned the overall testing time has been cut in half.

Western Electric spends annually many thousands of dollars on testing equipment. Always, the performance of test sets must be held up to the highest practical standards. "What was a satisfactory test a year ago may be out of date today," is the spirit of the Inspection Development Division.

Obviously, the concentration of the development work within a non-production department contributes as much to this program of strict control of test-costs as it does to the general improvement of the costs and results of inspection.

A trend toward standardization is one of the results that is bound to mean savings in the cost of test equipment.

For instance, the Inspection Development Division has developed three general types of testing sets useful for various purposes.

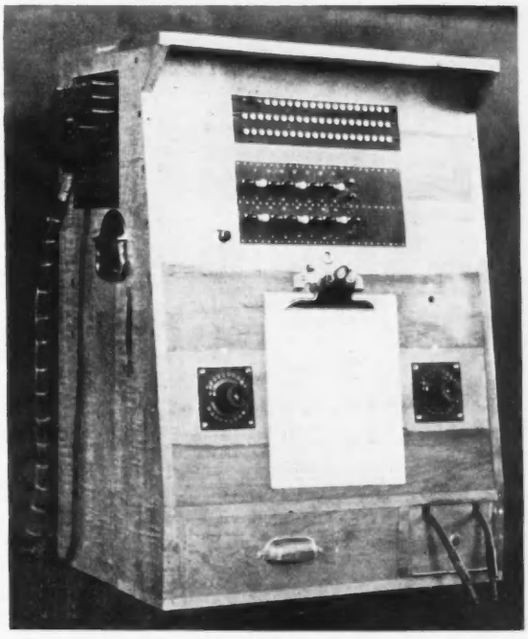
One is the box type of set, made to stand on a conveyor, a table, the floor or any convenient resting place. Another is the suspended or "rack" type. A third, also portable, is known around the Kearny plant as the "teawagon" type.

For each inspection problem the type of set most suitable for the production layout and conditions is specified.

Since the relative advantages of each of these types for different inspection problems is known, their use lessens the work of designing each new piece of test equipment. Cost of manufacturing the sets should also, in the long run, be lessened.

When two departments have closely related responsibilities, it is important that there should be a thorough understanding as to just where the responsibility of each begins and ends.

When Western Electric Company has a new product, or is to produce an old product in a new way or a new place, the Superintendent of Manufacturing Development and his engineers work out the manufacturing processes and layout. Usually they will also determine the points at which the work in process ought to be tested and will indicate their ideas as to the type of test which should be employed, or at least the standards which the test must meet.



*Another development in testing methods as used by the Western Electric Company is the "box-type" test set shown above. This, like the "teawagon" equipment shown in one of the accompanying illustrations, is portable, and was designed for some specific needs of the test department*

*STILL another type of testing equipment as used by the Western Electric Company is the suspended or "rack" type such as that shown at the right. Each of these pieces of delicate testing equipment is portable*

The Inspection Development Division then develops the actual test methods and test apparatus needed, and supplies the necessary apparatus. An important part of its work is then to deliver to the Works Manager's Inspection Department complete written instructions on the use of the methods and apparatus, and to "prove in" the latter. Supervision of the work of the inspectors is maintained until it is certain that apparatus and men are both functioning properly.

Should a test set at any time prove unsatisfactory, the Inspection Development Division is called upon. Otherwise, except for keeping written instructions up to date, its work of supervision is through when the workability of the setup has been demonstrated.

Its responsibility for constant improvement of tests is never ended, however.

And because of this, improvement in Western Electric Inspection and testing methods—from all possible standpoints of quality and costs—never ceases to be continuous.

**TO have a motor both special and standard sounds a bit like nature faking. And yet this company has obtained the advantages of both by a simple plan which you too very likely can adopt if you build motors into your own product.**

# "Standardizing" Special Motors

By JAMES S. KNOWLSON
*General Manager, Speedway Manufacturing Company*

SEVERAL times recently I have read articles by manufacturers of electrically-driven equipment, disclosing the various methods which they have found practicable in selecting what they call "small" motors to meet their needs.

In the November, 1929, issue of ELECTRICAL MANUFACTURING, for example, Wm. B. Pavey, president of the Economy Engineering Co., tells how the careful preliminary design of his equipment gives him sufficient leeway, in his choice of motors, to enable him to purchase them from various sources, rather than to feel tied down to any particular manufacturer. He finds it advantageous in his case to put his "motor eggs" in more than one basket, as against risking them in one.

Why we follow just the converse of this proverb, by sticking to one manufacturer for those motors which we ourselves do not wind, I shall explain presently. Everything else being equal, Mr. Pavey's policy is, no doubt, the logical one for him to follow. Each company has worked out the best compromise it seems possible for its particular case. Moreover, I have no doubt that most of these policies are sound so far as they contemplate motors that range from 2 to 10 hp., which are *attachments*, rather than integral parts of the machines.

But manufacturers, like ourselves, of small portable electric tools, are up against quite a different set of conditions. Basically, perhaps, one main difference goes back to the definition of a "small" motor. For, in motordom, terms are just as relative as they are in everything else. To me, for example, small motors are those which weigh, say, not more than 10 lb. They may range down to the 1/25 hp., or "one flea power" size, which weighs less than 1½ lb. However, operating them at the speed we do these light motors may be made to yield as high an output as 1½ hp. So, you can realize the novel conditions that we must face in selecting them properly.

But whether you consider manufacturers of small electric portable tools, like ourselves, where the motor is an integral part of the device, or of larger equipment in which the power plant is merely an attachment, such as the case with washing machines, it is equally important that the right motor be used. Now, there are three points in common which all of us strive for in choosing the motors that enter into our electrical equipment:

1. They must serve their purpose effectively.
2. A stock of them must be promptly available on short notice.
3. Their cost must be kept as low as possible, no matter how special they may be.

On those fundamental requirements we all agree. Sound business permits of no argument. They form a common point of departure. But, in order to meet these fundamental requirements, portable electric tool manufacturers must go at the thing in an entirely different way. How

different may best be understood by considering for a moment the remarkable development in this field and the place that portable electric tools have attained in industry from the rather crude start they got not so many years ago.

At first, they were a good deal of an industrial frill; a luxury; almost an experiment. Indeed, the small motor itself as a source of power is just coming into its own. Most of us can remember those old belt-drives, which carried power from the basement up through the various floors of five- and six-story buildings. This stage was followed by motors of 15 or 20 hp., which drove a long line shaft. Many were the battles waged—and still being waged in some cases—between the exponents of the individual drive and those who favored the line shaft set-up. These last, however, have gradually lost ground. For the most part, they have become the "group-drive" people of today.

I like to think of all this development as progress in bringing electrical power to a man's elbow. What we portable electric tool folks are doing is putting power into the operator's *hand*. We build a power plant which he takes to his work; the work is not brought to him. All of which, of course, is quite in accordance with development in other lines. For example, one hardly thinks today of allowing a $15 a week clerk to waste time getting up from his desk to answer the telephone. The phone is immediately at hand. It is even more foolish to permit a dollar-an-hour mechanic to walk to a drill press, when a portable tool in his hand can do the job. Our motto might well be "a tool in the hand is worth two anchored to the floor"—and, let me add, it's a whole lot cheaper.

*Less weight for the same power is the motor goal of every maker of portable electric tools*

Now, the manufacturer of any device of a portable nature—particularly one held in the hand—is interested primarily in keeping the weight down. Less weight for the same power is his goal. His worst nightmare, after a trade convention banquet, is a vision of some competitor who has succeeded in making *his* portable tool lighter.

I dwell on this question of weight at some length because weight is so vital a consideration in the selection of motors for portable electric tools. The builder of any such devices which must be grasped in the hand is interested, primarily, in greater power from less weight.

But go a step farther and remember that *speed* is one of the factors of *power*. It then becomes clear that higher speeds result directly in getting greater power out of a given weight of metal. Speeding up motors has done more to decrease the weight of portable electric tools than any other one thing.

As for types of motors, although the first portable electric tools employed either direct current or alternating current motors, I need only mention that stage in passing, for the requirements were found to be too stiff.

Next came a big step forward through the pretty general adoption of the series wound "universal" type motor. And here again speed played its part. It was only a few years ago that the universal motor, running at no-load speeds at from 6000 to 8000 r.p.m., was considered a pretty high speed motor. Today they are being operated at no-load speeds of from 18,000 to 22,000 r.p.m., with a corresponding increase in power output for the same weight.

But at speeds like these we must pay strict attention to the centrifugal forces involved. This means particular care in the construction of the commutator and to binding down the wires, and also to insulation. You can see, too, how important it is for such motors to be nicely balanced. Otherwise, the wires cannot stand the strain. Indeed, dynamic balancing of all rapidly moving armatures is to be highly recommended.

Let me digress a moment at this point and try to emphasize four precautions which every manufacturer of portable electric tools ought to take under careful consideration.

The first is Efficiency. The efficiency of these motors is important for reasons other than those which concern the manufacturer of equipment in which the motor is a mere attachment. While the power consumption of small portable tools is never a serious obstacle, a decrease in efficiency means undue heating up. And that must be guarded against in any device which normally is held in the hand.

My second warning concerns the necessity of giving every motor an individual test after it becomes part of the tool. In our own case we find that it is an excellent policy to put each finished tool made in our shops under a Prony brake before it is given a serial number and painted.

This question of an individual test links up closely with the third point I want to make. Insulation! In all electric tools designed to be held in the hand grounds are to be particularly guarded against for obvious reasons. Therefore, anyone selecting small motors for such use should be sure to see that they receive the test specified by the National Electrical Manufacturers' Association. I am reminded of an experience of our own, some years ago, when we took over a product the motors for which had been supplied by a manufacturer who was anxious to continue serving us. However, when we specified that they must stand 1000 volts, he advised us that they had no means in their factory for giving their windings so high a voltage test.

Lastly, any portable tool manufacturer who undertakes to make his own motors must take the greatest possible pains with his commutators. They should all be tested at twice the normal no-load speed at which the device will run, to see that there are no loose bars which will give trouble in the future by rising and spoiling the commutation.

To eliminate some of this construction difficulty the most recent movement is toward small motors of high frequency. There are excellent arguments here from the standpoint of portable electric tool manufacturers. For it at once eliminates all worry about wires and commutators, and also permits the motor to operate at constant speed. Indeed, the "squirrel-cage" induction motor, operated on a high frequency current—say, 180 cycles—offers an almost ideal solution from the standpoint of the tool manufacturer. But, alas, that is not the practical point of view for him to take. He realizes, to his sorrow, that only a comparatively few

users are warranted in going to the expense of installing the costly equipment necessary to produce this high-frequency current. Consequently, an economic, rather than an engineering reason forces us to fall back on the series wound motor, after all, for most general all-'round practical use in operating portable electric tools.

Of course, there is no denying that the series type motor has a disadvantage in that its speed is not constant. The smaller the load, the higher the speed. But, to counterbalance this argument, it has the very great advantage that that same increased load which slows down the motor also allows it to develop increased torque. Furthermore, danger from a burn-out is almost wholly eliminated, due to the fact that even when this motor is actually stopped there is still the resistance of both the field and the armature to prevent any rush of current through the winding.

This is very important on all portable electric tools which must, from the very nature of the service, be subjected to a considerable amount of overloading and abuse.

I believe it safe to say that to the series motor, more than to anything else, is due the fact that today portable electric devices of all kinds have passed out of the "convenient toy" stage. No longer do people turn to them only when other forms of power are not available. Today, portable electric tools take their place on the work bench, not merely for special odd jobs, but for straight production work, as well.

Since all motors for use in portable electric tools are necessarily built in as a part of the apparatus itself, we have always found great difficulty in obtaining any standard set of parts which we could adapt to our special use. Each type of tool that we manufacture requires special shaft dimension, special brush holder rings, and the like. Result! Such motors are too special, and the requirements too varied, to place them in the category of standard articles. As in the case of other portable electric tool builders, for a long time we faced two alternatives:

1. To build our own motors.
2. To buy from motor manufacturers in comparatively small lots, then wait months, perhaps, for delivery.

For many years we chose to build all our own motors. Even today we make a good portion of them, and find that it pays. But we are buying a part of them from one large motor manufacturer and expect to buy more as they are able to get their prices down and can give better deliveries.

No one can blame motor manufacturers for charging extra high prices for motors or rather, motor parts to meet special conditions. Not only is costly additional labor involved, but in making up these small special orders there is also considerable risk of having them turned back—a risk that runs into dollars and cents.

The way the matter usually works out is this: suppose a customer ordered 500 or 1000 small special motors from a manufacturer who is big enough to quote exceptionally low prices on standard designs. He is put to a lot of trouble getting our stuff out, and he charges accordingly. But, now let us assume—and this has happened more than once—that through some slight error on his part the motors fail to meet all tests, and the customer is forced to throw them back on the manufacturer's hands. Don't think for a minute that he pockets his loss with a grin and calls it square. Not at all! He compensates for this loss by adding an extra bit onto whatever he charges other concerns like ourselves when they come to him for special motors. In this way all of us have been accustomed to pay big prices for what we get.

Our problem, then, was to induce some large motor manufacturer to study the question seriously and see if, after all, there were not ways in which he could give us the specialization that we required and at the same time reduce his manufacturing costs to more nearly what they would be for a standard motor.

A way out of this difficulty is now being tried out with apparently a considerable degree of success. The company from which we buy a portion of our motors took a great interest in the problem. They delegated a draftsman, and put him on the job. This draftsman made motor layouts of several of the more common tools. He traced each of them in a different colored ink. Then he superimposed one on the other and discovered that the armature shaft extension was the one chief element of difference—the one thing that caused so many of our motors to fall into the "special" class. His next move was to lay out a shaft extension profile that would be large enough to cover all these ordinary cases. It was a very simple solution, after all. For, once an over-sized shaft extension was designed large enough for us to turn down to meet every special adaptation, it was possible for this manufacturer not only to greatly lower the price to us, but to stock parts and ship us motors on short notice.

*Speeding up motors has done more to decrease the weight of portable electric tools than any other one thing*

The experiment has worked out beautifully as far as we have gone, and has made it decidedly profitable for us to purchase from this one manufacturer, with the added advantage of knowing that we can get them on short notice.

Likewise, it gives the big motor builder just the kind of standardized product that he can turn out economically, at a good profit without comebacks.

I am of the firm opinion that the same plan might well be adopted by others besides ourselves. Indeed, I see no other practical way at present for any of us to cut down the cost of our motors and still continue to adapt them to the wide range of portable electric tools which the trade demands.

# Fewer Potted Palms and More *Action!*

## *A Plea for Better and Brighter Electrical Expositions*

By PHYLLIS KRAFFT DUNNING

*Home Service Director, The Society for Electrical Development, Inc.*

THURSDAY,
The Lantern
Well, this is the first time we have had any desire to be on a Chicago newspaper. What a swell place a man could die out there today; calling it The Toxx and the Cripes.
If the drys care for the information, they are welcome; we were asking what it is that's as elusive as an office boy during a World Series game; it's a bartender in a speakeasy that has a radio in the back room.
October
The sumac in the hollow
Is ablaze with color.
The fey curls upward, a living flame
Around the tree trunks.
The tops of the maples are topped with fire . . .
In my heart—ashes.
Olive Oliver.
The priority war between Mrs. Grinn and Mrs. Longworth seems to be less and less violent, but we are willing to be a laughing stock if parity is harder to settle than priority.
If the ice on the Potomac were as cold as the ice of Washington society, the Father of his Country could have skated across.
Electricity has gone babbitt, and it is a sad day for us romantics, who would trade a carload of labor-saving domestic appliances for one minor miracle.
It is as if Aladdin had evoked the slave of the lamp and commanded him to boil an egg three and a half minutes. Instead of conveying a warm and sloe-eyed princess half way around the earth for an evening's flirtation. We are sorry we accepted the passes to the Electrical Show. We might so much more profitably have stayed home with our imagination.

THERE are three reasons why I read the New York *Herald Tribune*. The first two have nothing whatsoever to do with this article, so I'll not go into them, but the third one resulted in the article. I refer to the column called "The Lantern," edited by Edward Hope.

Ordinarily The Lantern is gay and amusing. But ever and anon something happens to upset Mr. Hope just awfully, and then he uses his column to tell the world about it. One morning it turned out to be the electrical industry which had upset him. It seems he went to the New York Electrical Exposition at Grand Central Palace and . . . but let me just quote him:

"Electricity has gone babbitt, and it is a sad day for us romantics who would trade a carload of labor-saving domestic appliances for one minor miracle." (*This got me good and mad. I burned to tell Mr. Hope he wouldn't be so tradey if daily he had to face dirty clothes and dishes and rugs and make them clean.*) "It is as if Aladdin had evoked the slave of the lamp and commanded him to boil an egg three and a half minutes, instead of conveying a warm and sloe-eyed princess half way around the earth for an evening's flirtation. We are sorry we accepted the passes to the Electrical Show. We might so much more profitably have stayed home with our imagination." (*And nobody would have missed you at all, thought I, viciously.*)

"It is no use denying that we went to Grand Central Palace to see mysterious wonders. . . . Nothing wonderful happened. The genie that lives in the wires has been harnessed to countless percolators, toasters, vacuum cleaners, self-regulating clocks and weight reducing machines. . . . As far as the eye could reach in all directions it fell upon glistening vistas of nickel-plated flatirons, hair curling appliances and washing machines.

"It isn't that we object to labor saving devices. Personal labor saving has been almost an obsession with us for years. It is our opinion, however, that the electrically operated utilitarian contrivances should be confined to the shops that deal in them and the homes wherein they serve; expositions ought to devote their energies to the task of astounding and thrilling the populace." (*That, I mentally retorted, is the chosen field of the movies, too frequent attendance at which is doubtless the cause of this insatiable craving for excitement.*) "With scientists succeeding day after day in contravening one law of nature after another how can they expect the public to grow either lukewarm or perturbed over things that perform no more complicated services than boiling water or scorching bread. . . .

"There can be no gainsaying that electricity has gone quite babbitt. We have wasted what is to us valuable time and we are grieved as well as disappointed."

This dissertation got me not lukewarm and perturbed, as Mr. Hope so genteely puts it, but out and out hot and bothered. I accused Mr. Hope of having no imagination worth staying

**The Author**

*MRS. DUNNING'S articles in the June and September issues of* ELECTRICAL MANUFACTURING *created unsual interest not only because of her keen insight into the psychology of the housewife as a buyer of electrical appliances but also because she has the rare ability of expressing her thoughts interestingly*

home with, no vision, no sense, no appreciation of the opportunities for self-improvement which had been presented to him. The same day I went to the Electrical Exposition myself.

If I hadn't read Mr. Hope's diatribe I should doubtless have come away from the Exposition with my little packet of pamphlets, feeling that expositions are grand things and save a poor home service woman a lot of trouble. She can see, gathered together under one roof, practically all the worthwhile appliances. She can talk with the people in charge of booth A and find out why A washers are the very best washers in the whole wide world, and then she can trot to booth B and find out the same thing about B washers. She can get more information about new appliances in one day of diligent attendance at an exposition than she could in a week of traipsing from manufacturer's show room to manufacturer's show room. If the purpose of electrical expositions is to simplify the lives of home service women then everything is just dandy and you can all pat yourselves on the back because you have succeeded nobly in a noble undertaking.

However, beautiful faith in the eleemosynary character of businesses, industries and commercial undertakings of all sorts having been rudely shattered at an early age, I was unable to justify the exposition on the grounds of its satisfactoriness to me personally. I burned to convince myself that Mr. Hope was very, very silly and that any woman would be utterly fascinated by those rows of gleaming appliances, those exhibits of labor saving devices. Why, those appliances and devices were designed to make life easier for women, a fact which should act as an automatic attractor. That shows you how trusting I can be, even yet.

Well, I collected a couple of what would be called average housewives in any investigator's report, and took them to the exposition. The results were downright depressing. My girl friends got bored very rapidly. They had felt no urge toward washers, ironers or floor waxers, and they were seized by none at the exposition. They had vacuum cleaners, toasters, irons and refrigerators. They weren't even a little interested in curlers, percolators or heating pads. They saw one or two new devices which they characterized as "cute," and one or two more which they disposed of as "awful." Then they wanted to go to tea where they talked clothes and babies and food the whole time.

As I listened to that thoroughly domestic but entirely unelectrical conversation it was forced upon me that at least as far as these specimens were concerned, the exposition had completely missed the boat. They had failed utterly to get "the electrical idea." They had been exposed to a lot of electrical appliances which represented to them just so much merchandise, some of which they had, some they might like to have, and some they wouldn't want under any circumstances.

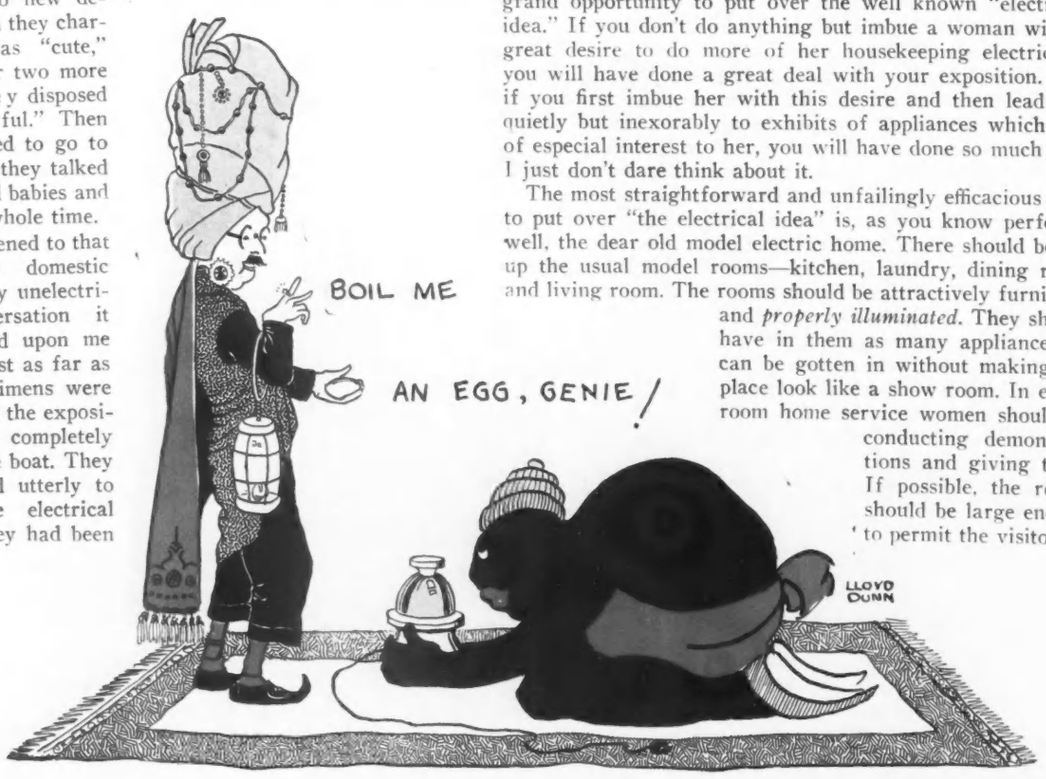
There had been no attempt to get them thinking of electricity as applied to their housekeeping problems, and they hadn't picked the idea up for themselves. They hadn't gone to the exposition expecting to see any mysterious wonders or to be astounded or thrilled. They had gone to see electrical appliances, and, having seen, had left in a state of the most complete emotional and intellectual calm. They were no more anxious to secure more electrical appliances and avail themselves of the blessings of electrical housekeeping after attending the exposition than before attending it. Unquestionably there were many, many other women in the same untouched state. I apologized mentally to Mr. Hope.

WHILE still in this chastened mood I heard a discussion of an electrical exposition at which the most successful booth was one displaying electric furnaces. It seems there was a fire (under control) going in the booth, and I don't have to tell you how people love fires and will dash to view one. The visitors to this exposition were nice, normal, fire-loving people, and they stopped to contemplate the exhibitor's fire. The result was he sold a lot of furnaces. There is a perfectly lovely moral in that story which you should be able to work out for yourself very easily.

An elegant booth all fixed up with curtains and an array of modernistic chairs may be tremendously artistic, but art is no treat to our American people. A vacuum cleaner posed against a velvet curtain may cause the exhibitor's heart to throb with pride, but it will leave the visitor cold and unmoved. Nor will a washing machine with a glass top permitting a view of a little water sloshing about in an otherwise empty tub excite Mrs. Housewife. Water-sloshing means nothing in her life.

Now, I disagree with Mr. Hope that the object of an electrical exposition should be to astound and thrill the visitors. I do believe, however, that the principle object should be to interest and educate, and that it is about time we all got together and realized that an exposition is a grand opportunity to put over the well known "electrical idea." If you don't do anything but imbue a woman with a great desire to do more of her housekeeping electrically you will have done a great deal with your exposition. But if you first imbue her with this desire and then lead her quietly but inexorably to exhibits of appliances which are of especial interest to her, you will have done so much that I just don't dare think about it.

The most straightforward and unfailingly efficacious way to put over "the electrical idea" is, as you know perfectly well, the dear old model electric home. There should be set up the usual model rooms—kitchen, laundry, dining room and living room. The rooms should be attractively furnished and *properly illuminated*. They should have in them as many appliances as can be gotten in without making the place look like a show room. In every room home service women should be conducting demonstrations and giving talks. If possible, the rooms should be large enough to permit the visitors to

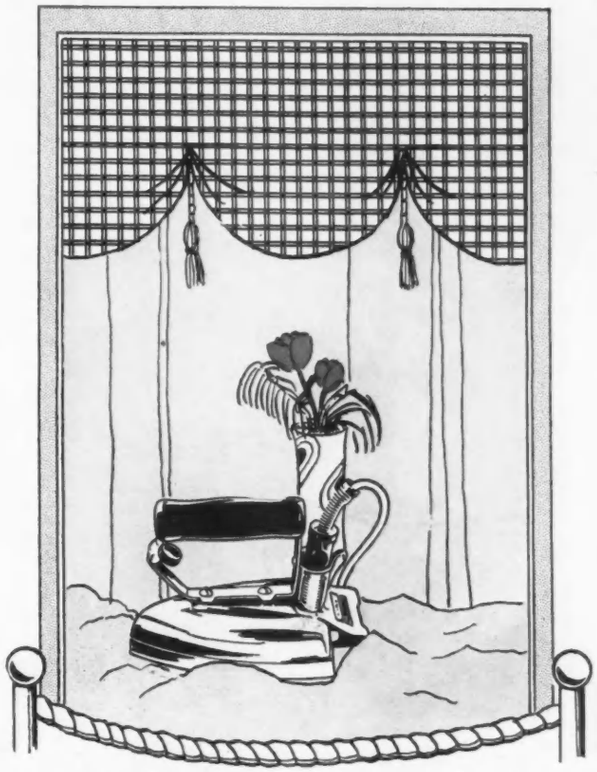


wander through them, but if this is not feasible set them up along in a row, three sides to a room, with the fourth side open so that visitors can stand and peer in.

Make the demonstrations complete. For instance, in the laundry, have an actual washing in progress. Go through the whole process—from sorting the clothes and filling the washer to drying and ironing the garments. Keep the finished washing on display, with a record of the number of minutes taken for each load from start to finish.

In the kitchen, have a whole meal in preparation, and let the women watch the preparation, the cooking, and the serving. Let the women taste the finished foods. In the dining room, have a demonstration of the use of table appliances. In the living room, the vacuum cleaner and floor polisher are best put through their paces. In the bedroom the hand cleaner, heating pad, exerciser and other devices may be shown in practical operation. It doesn't take any imagination for a woman to be able to visualize the usefulness of appliances in her own home when she sees them at work under homelike conditions.

Now I know just what you're thinking, and you're perfectly right. Every exhibiting manufacturer would think that his particular appliances should be the only ones shown in the model home. Manufacturers are all like that. To overcome this complex the first thing to do is to explain that in addition to their booth they will have the privilege of exhibiting their appliance (or appliances) for one day in the model home. Thus they will derive all the usual benefit of the booth, plus the direct and indirect benefits of the model home. Changing the appliances daily should not be a very difficult job.



*"An electrical appliance posed against a velvet curtain may cause the exhibitor's heart to throb with pride, but it will leave the visitor cold and unmoved"*

The second thing to do is to present every visitor to the model home with a booklet, in which would be listed the appliances used in the home and the various manufacturers making them, with the booth number at which each make of appliance can be seen. For instance:

Waffle Irons

The Hotsup Company .....Booth 5
The Gogglethorp Company ....Booth 9
The Tasteswell Company .....Booth 28

and so on. The booklet should be prefaced by a short explanation that the appliances in the home are changed from day to day, and that their presence in the home on the particular day the visitor attends the exposition does not indicate they are the only appliances the visitor should consider. Urge the visitor to attend the booth of each exhibitor showing appliances of the type in which he or she is interested.

The third thing to do is to put up an index on the wall or outside every room giving the complete list of exhibitors of every kind of appliance used, with booth numbers. This index should be permanent throughout the show. Thus, if a woman got interested in washers, she could look at the index and see that washers were to be seen at booths 2, 10, 19, 35, and so on. Then, to make everybody feel better, put up a sign here and there announcing that the appliances are changed daily and are to be considered simply as representative types. This ought to take care of everybody.

Before going on I want to urge that home service women be about the home constantly to give advice and answer questions. As the success of the whole scheme depends upon everybody being absolutely ethical and not saying anything derogatory about any appliance, exhibitors should be very careful to have only their most skilled and experienced demonstrators and home service women on the scene, women who have learned that knocking one's neighbor profiteth one nothing.

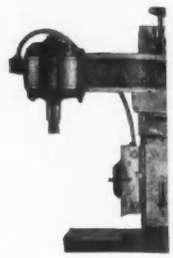
As for the individual booths, I have always been one to doubt the commercial value of stunts, but if there is something your machine will do which others won't, give that machine a chance to show off as dramatically as possible. A vacuum cleaner demonstrating the water lift test to prove its enormous suction power would be interesting and convincing. So would a sewing machine showing how to ruffle and tuck and hem. So would a refrigerator correctly loaded with the sort of foods contained in the normal home-loving refrigerator, the foods reposing in modern refrigerator dishes. So would a range with the makings of a complete oven dinner properly placed on the shelves. The foods could be artificial and the range cold if necessary.

The important thing is to make your exhibit tell a story. Remember that most electrical appliances are not beautiful, and must rely, like a homely woman, on something beside looks to get them by. Put your product through its paces in the most forceful and attention-compelling way possible. So may we, while not claiming much in the way of miracles, at least capture the interest of visitors and put over to them the fact that if the genie who lives in the wires has been harnessed it is really all for the best, and that while princess-corralling is all very well upon occasion, for everyday purposes, egg boiling, water heating, rug cleaning and clothes washing are really more practical accomplishments.

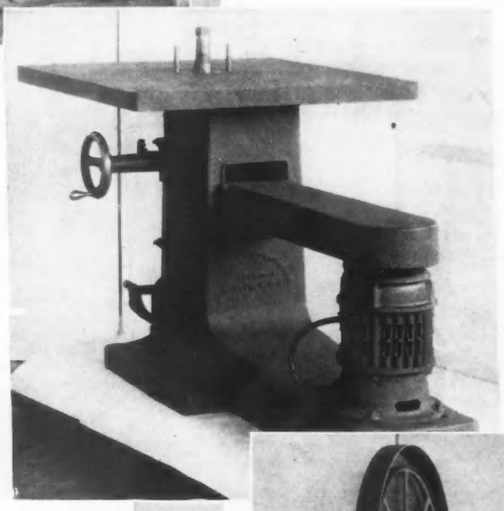
*"Mr. Hope would't be so tradey if daily he had to face dirty clothes and make them clean."*

# *Here is a Market for*

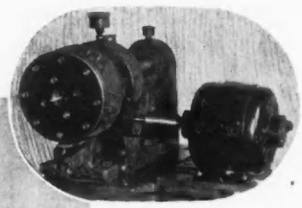
## Woodworking



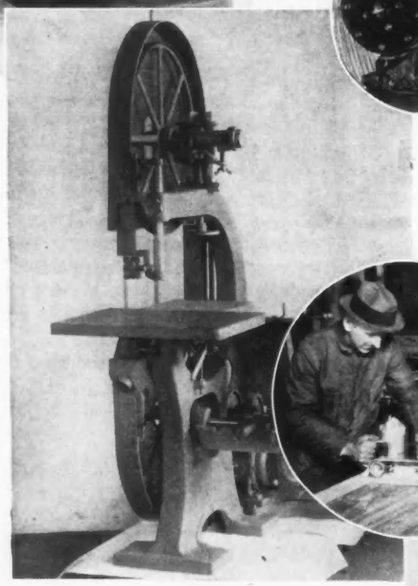
*WITH the ever increasing movement toward the modernization of industrial equipment many manufacturers of woodworking machinery are designing their different machines for the application of motor drives, and these, of course require the application of some kind of control apparatus as well as the smaller types of switches and attachment cords*

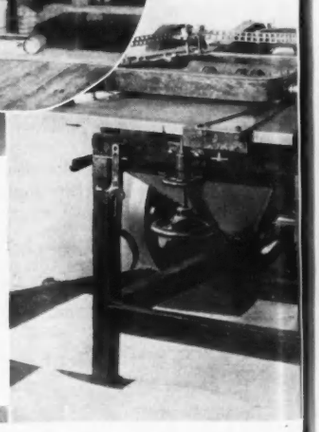


*ALL manner of ingenious drives are being developed for woodworking machines, such as that shown at the left, while the one above provides horizontal movement for the motors driving the spindles on this boring machine*



*Extensive use is being made in the wood working industry and the building fields of portable and semi-portable woodworking machines*

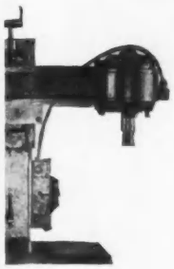




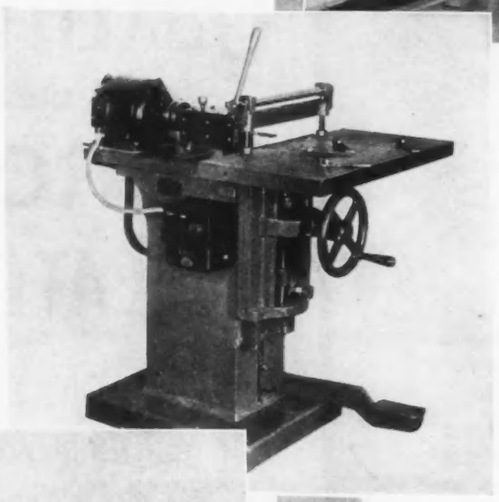
*PORTABLE sanders, band saws, revolving face plates and many of the heavier types of machines are now equipped with electric motors, flexible, and rigid conduit and suitable motor starting and control apparatus of different capacities*

# Electrical Equipment

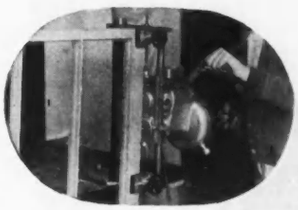
## Machinery



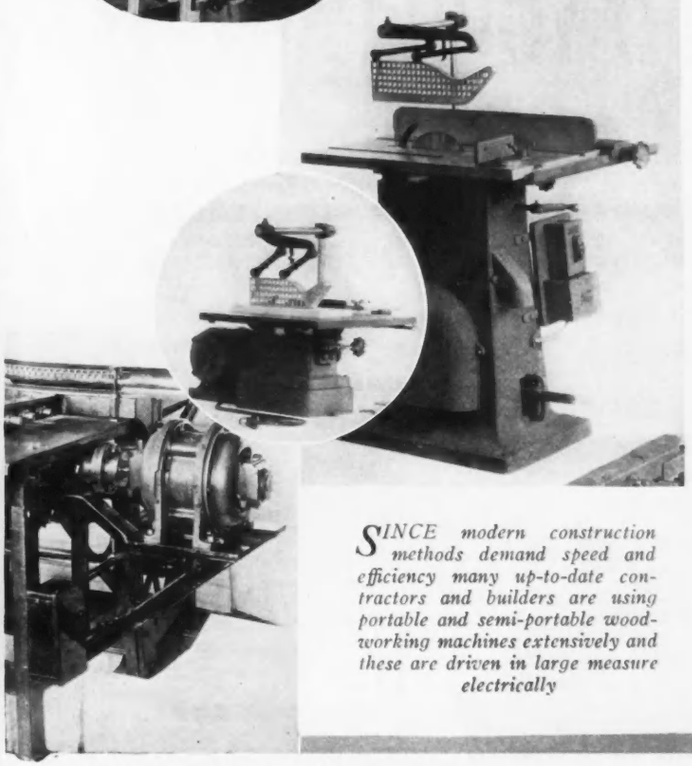
*IN much of the modern wood-working machinery the motors are built integral with the machines, although there are as many machines on which the motors and control are mounted separately, such as some of those shown here*

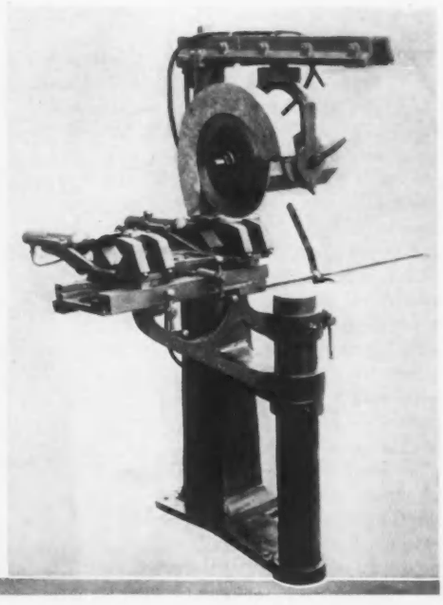


*PORTABLE electrically driven saws are probably the most extensively used of the portable tools and in most cases the motors are built directly into the saw mechanism, as that shown in the view above. With such saws as these it is the practice to furnish 20 or more feet of extra heavy rubber covered attachment wire and some simple form of switch or control*



*One of the semi-portable types of wood working machines is shown in the view below. It has the motor mounted on the saw shaft*





*SINCE modern construction methods demand speed and efficiency many up-to-date contractors and builders are using portable and semi-portable wood-working machines extensively and these are driven in large measure electrically*

*Two of the reasons for uniformity and quality in Ceco products are shown in the illustration at the right, which is one of the posters mentioned in the article, and in the view above which is but a very small section of the tube testing department*

**An outline of some of the methods employed and some of the results obtained by the Ceco Manufacturing Company in its interesting campaign to insure uniformity and quality in all of its various products**

By WILLIAM W. BAXTER
*Associate Editor*
ELECTRICAL MANUFACTURING

THERE is a tendency in all business—and the radio tube industry is no exception—to over-emphasize growth in volume. Such growth is important, because it reflects strength of capital, organization, and an ever-increasing public acceptance, yet, it is never important of itself, and it should never be so considered without some thought being given to those things that have made possible this growth in volume.

Undoubtedly the first of these is quality of product. No institution, no matter how great its prestige, its public acclaim, its capital structure, its sales organization, or its advertising, can keep moving forward unless it maintains quality in its product. Quality means not only the best in materials and workmanship but uniformity as well, and to maintain quality and uniformity demands the use of the best obtainable in materials; the application of the most advanced and accepted in scientific and engineering principles and adequate modern facilities with which to coordinate these essentials.

It would appear then that the manufacturer could well point with pride to the quality of his product rather than the growth of his business. Such is the case with the Ceco Manufacturing Company of Providence, R. I. This organization manufactures a quality product and one of uniformity; it advertises quality rather than growth of business, and to make

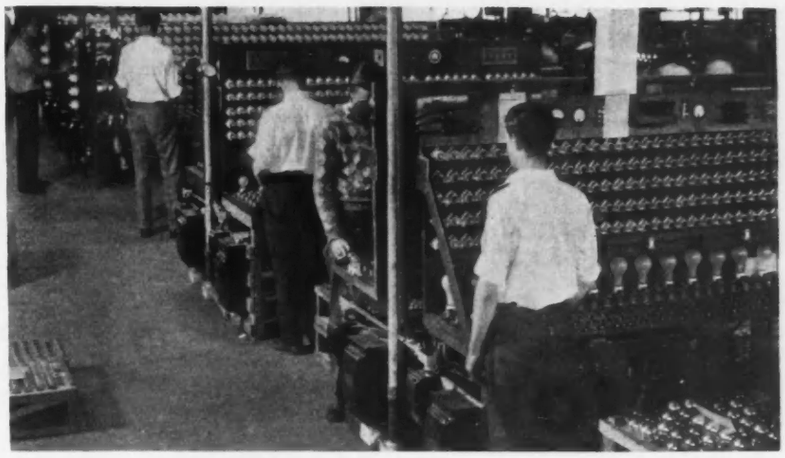
*EVERY function of Ceco radio tubes is thoroughly tested before the tubes are accepted for shipment, and to insure that this is properly done such test equipment as that shown at the left is provided*

these things possible it has evolved a most unique personnel training plan to insure the continuance of quality and uniformity in its radio tubes.

This plan has been so successful and it offers so many opportunities that any manufacturer could benefit from its application to his business. It is comparatively simple, involves but little expense and is so flexible that it can be easily adapted to any conditions. In large measure it follows along the line of safety campaigns and similar plans to promote safety or encourage the prevention of waste. There is nothing complicated about the scheme and it requires but the minimum in time to make it successful.

An example of what the plan has accomplished in one instance can best be illustrated by citing the experiences of the Ceco Manufacturing Company over a period of five years. Starting in 1924 some 12,000 sq. ft. of factory floor space were ample for maximum production with but twenty employees. By 1927 the factory area had been increased to 28,000 sq. ft., with several hundred workmen and in 1929, the factory had been enlarged to cover 120,000 sq. ft., and the working force had grown to 1000 employees, an increase of more than 1000 per cent in factory area and 500 per cent in number of workmen. Practically all of this growth is attributed to quality and uniformity of products.

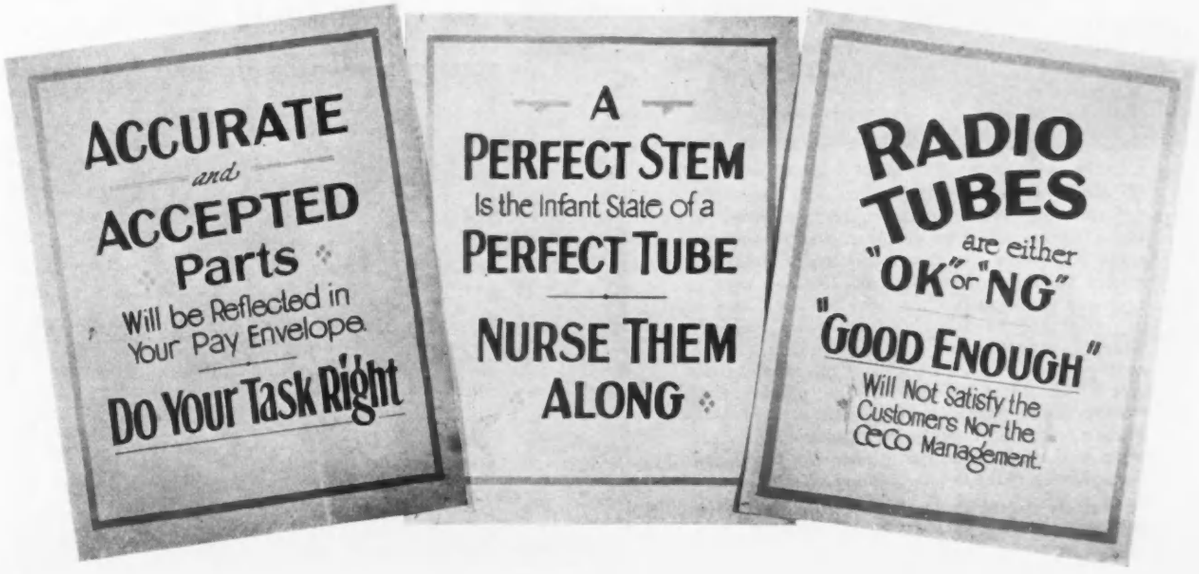
The Ceco Manufacturing Company is a small organization, as compared with other manufacturers in the electrical industry. The business was started in a small way in 1924 by Ernest Kauer, now president of the company, to manufacture radio vacuum tubes. Today Ceco is one of the largest manufacturers of its kind in the world, and this position was attained only by strict adherence to the policy of making nothing but quality products. Nothing else would be accepted, although it took considerable courage on the part of the management to stick to its demand for nothing but the best, for in the radio tube industry the demands for high standards often result in the rejection of as much as twenty-five to forty per cent of one day's output.



*Every vacuum tube manufactured in the Ceco plant must undergo the most rigid inspections and tests before it is accepted for shipment. In all there are some sixty-four inspections for every tube, aside from static and dynamic tests. The illustration shows a small section of the room in which radio tubes are seasoned before testing*

Today there are upwards of ten million Ceco radio tubes in use and every one of these was made with but the one thought of quality and uniformity in the minds of every employee in the organization. Radio tube manufacture involves many delicate and tedious operations, some of the tubes requiring as many as sixty separate production operations before they are completed. In the Ceco plant rigid inspection is demanded after every step in production. As an average this amounts to about sixty-four inspections and tests for each tube, which does not include seasoning and the static and dynamic tests. With a record of 55,000 radio tubes manufactured daily it can be seen that Ceco inspectors make approximately 3,520,000 tests on radio tubes every day. Aside from these there are the thousands of tests and inspections of raw materials and parts.

*POSTERS similar to those reproduced below are hung up at strategic points throughout the plant of the Ceco Manufacturing Company in an attempt to encourage its employees always to strive for uniformity and quality in the products of the company. This procedure is carried on much in the manner of a safety campaign, and some very remarkable results have been obtained from the practice*



To insure uniform quality in materials Ceco maintains an extensive laboratory where engineers and chemists are ever at work seeking new and better materials and better ways of utilizing those that cannot be improved upon. As may be seen, with these countless millions of inspections, innumerable opportunities are always present for some error to creep in, but in the main, Ceco's tests are so rigid that it is seldom a defective tube ever reaches the market.

CECO does not rely alone upon tests and inspections to obtain uniformity and quality in its products. It instills the idea into the minds of its employees that quality and uniformity are essential both for the welfare of the company as well as that of the workmen. Ceco is continually telling its employees "You can't have your cake and eat it too," or in other words, "If you want work and steady employment you will have to assist the company in making the best and that must be of uniformity and quality." Success for the company means success for the employee. More orders for tubes mean more work in the shop, but to keep these new orders for tubes coming in regularly, the workmen are told, requires that every tube made must conform to the high standards set to insure quality products.

The first step in the procedure is the selection of employees. Only the highest types of men and women are employed. It might be said that these are "hand picked." Each applicant for a position is very carefully examined both as to ability and mentality, thus insuring none but the better grades of workmen. Once employed the worker undergoes a very carefully planned course of instruction in the duties he or she is to perform. Dominating this entire training period is the one idea—quality. To further instill this idea into the minds of the employees posters similar to those reproduced elsewhere in these pages are posted at strategic points throughout the plant. Every one of them emphasizes the need for care and accuracy. Some of them point out the relations between different tube parts in order to show the necessity for accuracy, to the end that the tube will be a quality piece of apparatus.

One might conceive the idea that after once having seen these posters they would not continue to convey the idea of quality to the workmen, but such is not the case. There are literally dozens of them all over the Ceco plant and their positions are changed periodically so that the various employees are continually reading different posters.

One poster reads, for example, "Quality Products Mean Profit and Repeat Orders," another says, "Accurate and Accepted Parts Will Be Reflected In Your Pay Envelope," while still others refer to the construction of tube parts.

Actual savings, increased production and fewer rejections are the results of these posters in the Ceco plant. They have proved their worth and the plan of continually posting new notices and changing the old ones to different locations is to continue.

TO further augment the effect of these posters and to further create the feeling of good-will between employee and management Ceco has adopted the practice of supplying its shop forces with musical programs twice daily. These are radio broadcasts and are used for an hour each in the morning and afternoon. Remarkable results are reported. After considerable experimenting it was found that radio lectures, classical music and similar programs were not appreciated by the workmen, so that now most of the programs are popular or dance music from bands and orchestras. These programs have materially increased production during those periods of the afternoons that were always slack before. It is well known in industrial manufacturing that after about ten o'clock in the morning and three o'clock in the afternoon there is a slowing up in production and these musical radio programs have had the effect of keeping up production at these periods.

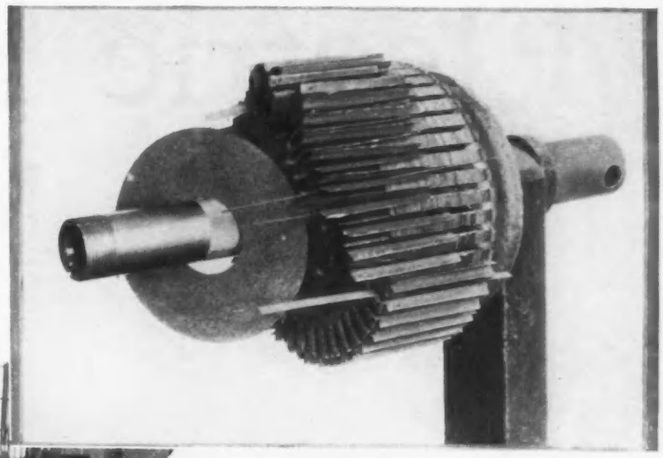
As another means of keeping pleasant relations between the company and its employees Ceco provides clean, orderly and well-ventilated and lighted factory departments, and in addition there is a cafeteria and recreation room.

To still further increase the use of Ceco tubes and to insure that their users will obtain best results from them, Ceco has installed an elaborate laboratory to conduct experiments with radio circuits.

All to the end that Ceco is doing its utmost to make a quality product, uniform throughout, and it takes pride in pointing to this uniformity and quality rather than increase in business.

*EVERY department in the Ceco plant is arranged for mass production, as may be seen from the two illustrations. That at the top is one of the many benches in the department where tubes are packed in cartons for shipment. Extreme care is exercised to insure that the tubes are not damaged in transit and handling. All tubes are carefully wrapped in cotton packing with an instruction sheet giving the characteristics of the tube and the uses for which it is intended. One of the many manufacturing operations is shown at the right. These operators are engaged at assembling certain parts of the tube as it passes along the production lines. Notice that special equipment has been provided in each section of the factory and that all tubes are handled in trays or crates to prevent damage*

# Electrical Materials Widely Used—



# "Fish-Paper"

SINCE the early nineties, "fish-paper," known also as rawhide fiber and by many individual trade names, has grown steadily in importance and usefulness. It has been improved as time has gone on, of course.

Fish-paper is made with the greatest care and watchfulness from unsized all-cotton cellulose stock, without "loading" of any kind. All foreign matter must be removed, or uniformity in the finished product cannot be effected. Other contributions to uniformity are made by processing of various kinds.

The untreated stock is first subjected to the action of a chemical reagent, in passing through which the cellulose is hydrolized and the surface gelatinized so as to make sure of a homogeneous mass when it passes through the laminating machines.

Following this process, all chemicals are removed by leaching or draining, and then the paper is dried and calendered to give it a smooth, glossy surface. It then goes through a thorough seasoning before it is offered in market. Fish-paper may be had in sheets, rolls and strips of a thickness of four one-thousandths of an inch and more.

In the old days, when the electrical industry was young and undeveloped, insulating paper requirements were much simpler than they are now. It was just a matter of furnishing low voltage resistance—not at all a difficult undertaking in so far as fish-paper was concerned.

BUT with the advance of the electrical business, requirements have multiplied and insulation makers have had to advance the quality of their product by producing fish-paper of higher dielectric strength. Improvement of both bending and tearing strength, with the grain and across it, have had to be made, for cracks or breaks defeat the very purpose of insulation and waste the time and labor used in application.

Other necessary characteristics of fish-paper are density and hardness and smoothness of surface which mean resolute resistance to abrasion. There must be assurance that the plies will not become separated, one from another. This, so that there will be no splitting nor delamination, no flaws through the thickness of the sheet.

There must be also thorough flexibility. This flexibility is not to be confounded with mere pliability, but is rather that certain, definite snap or spring which is required in many applications. Of great importance are uniformity of size, texture and thickness, so that insulating requirements of the electrical manufacturer are fully met, with satisfaction and without guesswork.

FROM the beginning of its production, the outstandingly important application of fish-paper has been that of linings for armature slots, its greatest usefulness today; but there has been a great development in its use in other parts of motors and electrical equipment generally, such as linings for metal boxes and metal tubes, base and stiffener for duplex cloth, heads for insulating tacks and staples and coil windings. Fish-paper has, through tests over many years, made itself indispensable in the electrical field and there is nothing which can take its place as a staple of standard worth.

The many advantageous characteristics of fish-paper, singly or in combination, have developed such a strong appeal to the electrical industry and to industry generally that new uses are being found for it constantly for mechanical purposes as well as electrical.

While this worthy material has been standardized in several grades to meet known applications, producers are constantly called upon to furnish fish-paper to meet peculiar conditions and requirements. Investigators find it quite to their advantage to study more deeply the further adaptability of this material and to determine how and why its many-sided character fits it for new uses for the benefit of public and producer.

# Electric Railway Motor Repairs

By WILLIAM W. BAXTER
*Associate Editor* ELECTRICAL MANUFACTURING

**PROBABLY the largest railroad electric motor repair shop in the world is that of the New York, New Haven & Hartford Railroad. It is located in the Bronx, New York City, and is known as the Van Nest Shops. In it from 150 to 160 electric motors, ranging in size to 680 horsepower, are repaired each month, and in addition more than 100 auxiliary and industrial type motors are sent to the shops for various repairs.**

TO the average motor repair shop owner the business of reconditioning industrial electrical equipment is thoroughly familiar. However, few of these repair shop operators have had the opportunity of learning how motors and other electrical equipment are maintained by a large electrified steam railroad. For this reason ELECTRICAL MANUFACTURING presents a brief explanation of motor repair shop practices on the New York, New Haven & Hartford Railroad, in its electrical repair shop, known as Van Nest Shops, located in the Bronx, New York City.

The New Haven was one of the first steam railroads in the world to undertake the electrification of its main lines. This work was started in 1906 and was undertaken because of the constantly increasing traffic on both the New Haven and the New York Central Railroad which was causing serious operating and ventilating problems in the Park Avenue tunnel approach to Grand Central Station in New York City. Another reason for electrification was the fact that an ordinance was passed in New York City in 1903 which prohibited the operation of steam locomotives in certain districts of the city after a period of five years.

By 1907 the New Haven had acquired considerable experience with the electrification of steam lines for the reason that beginning in 1895 it had started the electrification of several of its branch lines and by 1907 five of these had been completed and were in operation. These were the Nantasket Beach Branch, electrified in 1895 with an overhead trolley system, operating on 600 volts, direct current; the Nantasket Beach Extension, electrified in 1896 with a third rail distribution system, operating on 600 volts, direct current; the Hartford to New Britain and New Britain to Berlin branches, electrified in 1896 with a third rail system, operating on 600 volts, direct current; the New Britain to Forestville Branch, electrified in 1898 with a third rail system, operating on 600 volts, direct current, and the New Canaan to Stamford Branch, electrified in 1898 with an overhead trolley system, operating on 600 volts, direct current.

It should be interesting to notice in this connection that the electrification of the Nantasket Beach Branch, completed June 30, 1895, represents the first application of electric power to steam railroads, and the extension of this branch the first use of a third rail distribution system in railroad history.

Such experience as the New Haven had acquired with the electrification of these five branch lines did not include any experience with the operation of electric locomotives in high speed, heavy traction service, because such locomotives were practically unknown at the time. When electrification of the New Haven was first begun in New York City the outstanding electric locomotives of the day were those operated by the Baltimore & Ohio Railroad. These were employed in tunnel service and were designed for slow speed, short hauls, and relatively heavy traction requirements, which made them unsuitable for use on the New Haven.

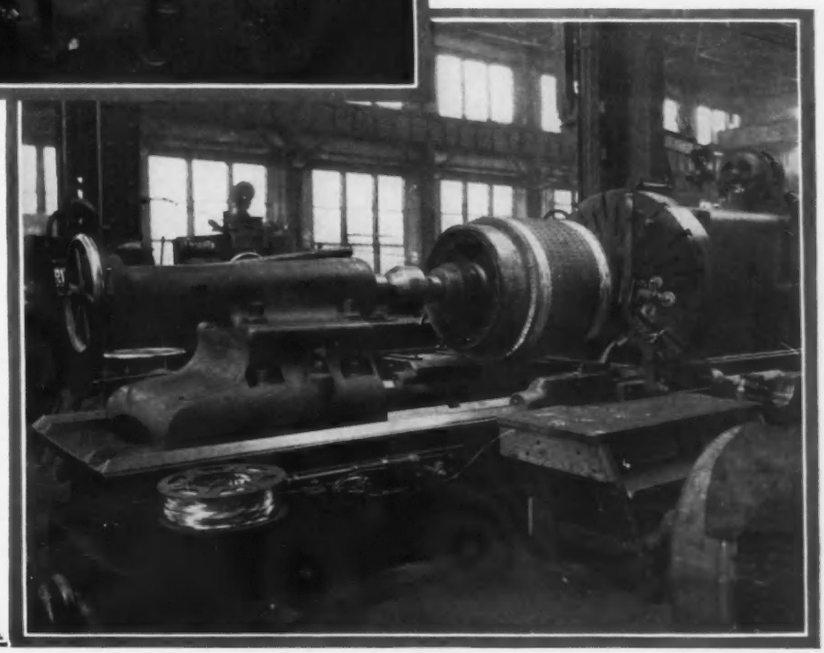
WHEN work actually began on the electrification project the New York Central decided to electrify its line entering Grand Central Station with a 600-volt, direct-current system, using third rail distribution. The New Haven connected with this line at Woodlawn, N. Y., twelve miles from Grand Central Terminal, so that at first it appeared feasible for the New Haven to run steam locomotives as far as Woodlawn and then change to electric traction. There was an objection to this policy, however, in that it was not considered economical practice to establish an engine terminal and power interchange facilities at Woodlawn, and the delay there would stop at a very bad point, the steady flow of heavy commutation traffic that the New Haven handles into New York City. These objections caused the New Haven to decide upon electrifying its lines to Stamford, Conn., a point thirty-three miles distant from Grand Central.

After due consideration an 11,000-volt, 25-cycle, single-phase, alternating-current system was decided upon, with an overhead trolley distributing system. This was chosen

# Repairing Motors for the New Haven Railroad

*MACHINING commutator slots is no simple job on such armatures as that shown above. This is one of the 250-h.p. motors that has the armature mounted concentric with the axle of the locomotive driving wheels. Below is a 4-ft. lathe as it is being used for banding large armatures and machining armature shafts*

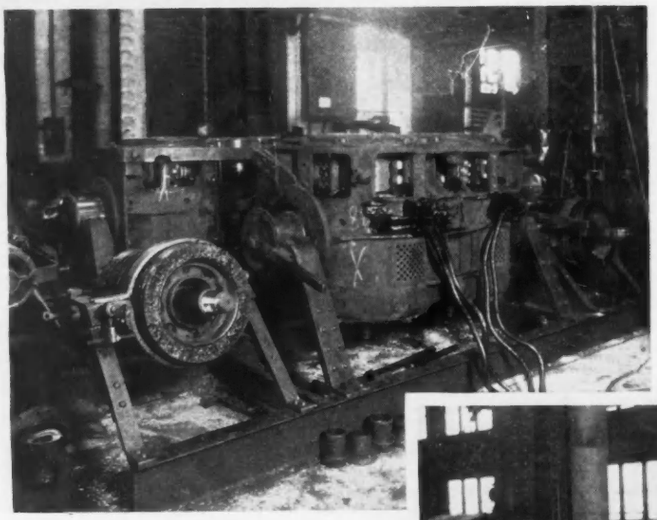
*SOME idea as to the extent of the work and the facilities available in the Van Nest shops of the New Haven may be had from reference to the illustrations on this and the three following pages. Directly above is the armature repair section. Here motors of all sizes are reconditioned. Those mounted integral with the locomotive driving wheels at the left are 250 h.p. for operation on both alternating current and direct current. The smaller armatures are for 170-h.p. motors of the same type*



*PRACTICALLY all of the electric motors used as motive power by the New Haven are of the single-phase, commutator series type. The different methods of drive are gearless quill, geared quill, geared axle, and in one instance side rod. The original gearless type main motors have been in service for almost twenty-three years, and in that time the locomotives in which they are mounted have each traveled more than a million and one-half miles. While their speed is not high, as compared with many industrial motors, their loads are frequently heavy, and they must operate under all sorts of weather conditions at variable speeds with many stops and starts*

*MUCH of the equipment in the Van Nest shops is especially made for motor repair work. The machine above is employed for banding armatures and for milling the slots in commutators. This operation is performed with the motor-driven attachment on the tail stock of the machine*

*TO expedite repair work in the Van Nest shops many special tools and fixtures have been provided, such as the assembly fixture shown in the illustration below. This is a device employed for assembling armatures in the twin mounted frames. It is so constructed that either the armature or the twin frames can be turned to any desired position, which is a great help in this work. The armatures are handled by overhead traveling cranes*



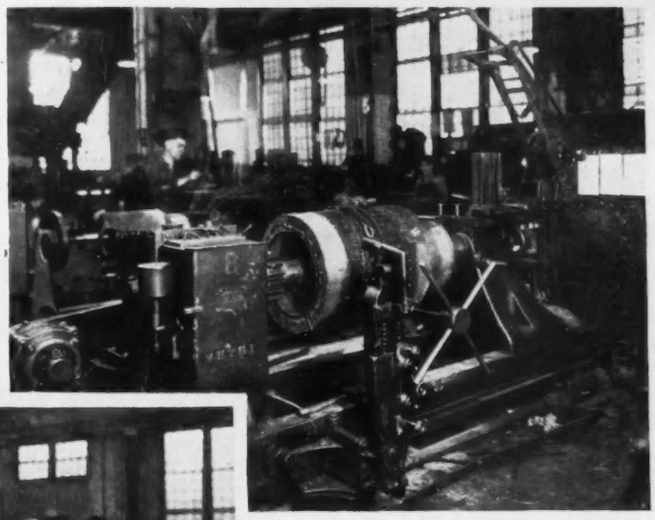
*SOME of the twin motor frames used on both the electric passenger and freight locomotives of the New Haven Railroad are shown in the illustration above. This view shows the assembly floor of the motor repair shop where all motors are assembled after they have been reconditioned. Large capacity overhead traveling cranes handle all the work and every facility is available. Each of the different operations is carried on in this shop in separate departments or sections*

*END milling machines, such as that shown at the left, are available for machining the anchor slots in armature cores for the laminations. All motors receive every necessary attention in the Van Nest shops, and equipment is available for the purpose. The workman at the right is putting the finishing touches on one of the large transformers used on the heavier types of electric locomotives. This is the only electrical repair work carried on in the motor repair department other than that of reconditioning electric motors for electric locomotives, multiple unit cars and industrial uses*

*REPAIRS to frames and stator coils comprise a large part of the work in the Van Nest motor repair shops, and in order to expedite this work, it is carried on in two sections of the shops. In all of the larger motors there are the usual field coils and in the New Haven motors compensating field windings as well. In the view at the right the workmen are assembling the coils in a frame. Ordinarily, in making repairs to the frames, the soldered connections between the coils and field coil connectors are broken by heating with a blow-torch, the coils are removed and new ones replaced when needed. Four men are usually employed in this work, and the frames are placed on benches like those shown*

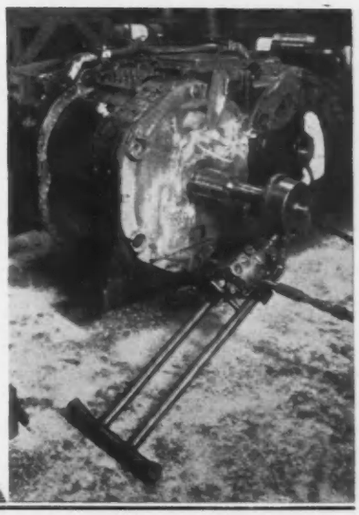
*SUCH work as that of fitting new bolts and making other repairs to the motor frames alone is done in the department shown at the right. This work is done during and after the motor field coils have been repaired. As has been stated, all work requiring machining is performed in another section of the shop, where there is every type of machine needed to handle any part of a motor, no matter what its size*

*ANOTHER feature of the manner in which the Van Nest shops operate is safety. Every precaution has been taken to safeguard the workmen, such as requiring that they wear goggles when necessary, and a well-equipped first-aid room is maintained in the shop for emergency purposes*



*SOME of the additional special equipment in use in the Van Nest shops is shown in the illustration at the left and in that below. The machine at the left is employed for banding armatures and milling commutator slots, while the home-made device shown below is a line reamer for the armature shaft bearings. After the motor frame has been completely repaired, new bearings are applied, and these are line-reamed with the motor end frames mounted in place, thus insuring absolute alignment of the two opposite bearings*

*ATTENTION should be called to the orderly arrangement and the cleanliness of the New Haven's motor repair shops. Every department functions as a unit, and in each there is adequate equipment for the efficient handling of the work assigned to that section. The floors are of concrete and are covered with sawdust, where oil accumulates. Ample natural light is provided by large skylights. Unit heaters mounted upon columns keep the shop at uniform temperature. Large numbers of convenience outlets are provided in every department for the attachment of extension lights or the connecting of portable tools and many types of testing apparatus*



*BEFORE any repairs can be made to the gear drive type of motors operated by the New Haven, the pinions must be removed, and this is done with the device shown above*

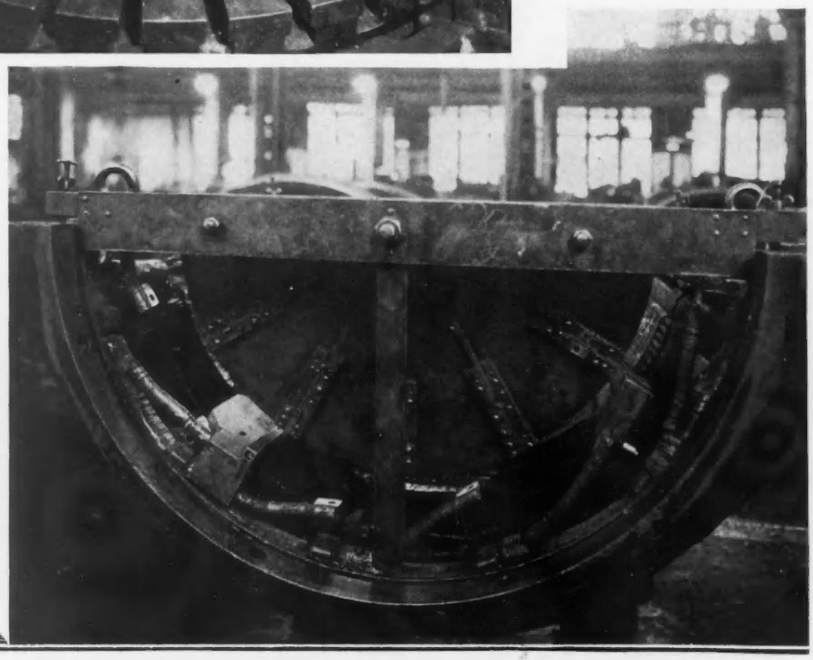
*THIS tool, referred to above, is the conventional type of pinion puller, except that it is considerably larger and provides considerably more power*

*SINCE it is a practice on the New Haven to overhaul completely all of its motors, provisions have been made to replace commutators and core laminations, when necessary. To do this requires a large and powerful press, such as that shown in the illustration in the center of this page. This press is some 20 ft. in diameter, to accommodate the larger types of motors and will exert a force of 295 tons pressure. Extremely heavy clamps hold the work in place, and, as the illustration shows, the press is set up as it is used for applying a new commutator to one of the smaller types of motors. To give some idea as to the size of the press, the arms or clamps are 5 ft. in length, 1 ft. in depth and some 6 in. thick of solid steel bars*

*FOR the handling of the armatures and core laminations on the smaller types of motors, smaller presses are available in other sections of the repair shop*

*UPWARD of 160 main motors, used on locomotives and multiple unit motor cars, are repaired every month in the Van Nest shops, together with many auxiliary and industrial motors*

*ABSOLUTE alignment of brush holders and brushes is essential in motor repair work, and in order that this may be done correctly and efficiently, the New Haven has provided such special devices as that shown in the illustration at the right. It is a gage or fixture that is placed upon the motor frame to set the motor brush holders in their correct positions. The frame of the device rests upon the finished joint face of the motor frame and is adjusted accurately by means of the four set screws shown in the supporting arms. To this frame are riveted two flat plates, one being shown here, and upon these plates are the required number of indicators properly to locate the brush holders. Provisions have been made in the construction of the motors to accommodate any desired adjustment*



because it provided economical transmission of power, was highly flexible and imposed no limits on the future extension of the electrified zone. The extent of the flexibility of such a system as was installed is shown by the fact that it is possible to operate over the same lines a multiple unit train of from one to ten or more cars, high-speed electric passenger locomotives, motor-generator freight and switcher, and single-phase freight and switcher locomotives.

In the planning of its electrification project the New Haven was confronted with many problems, some of which had never before been attempted. Among them were:

1—The generation of single-phase power by steam turbine units.

2—The installation of high-voltage trolleys that were constantly exposed to the exhaust of steam locomotives.

3—The installation of an overhead conductor system on a four-track railroad.

4—The development of a selective system of circuit breaker protection to handle short circuits of relatively high voltage and relative frequency, as compared with commercial equipment.

5—The first use of gearless single-phase motors.

6—The starting of a service without a trial period for the elements included in power house, line and locomotives.

7—The undertaking of an extensive electric service by a steam railroad organization.

8—The problem of providing steam from an electric locomotive for passenger train heating purposes.

**INASMUCH as there is considerable other electrical apparatus reconditioned every month in the New Haven's Van Nest Shops, other extensive facilities have been provided for this work. Heavy work is performed on the main floor of the shop and most of the lighter apparatus, such as pantagraphs, and auxiliary equipment is overhauled on a balcony extending along one side of the shop.**

*EVERY piece of equipment overhauled in the Van Nest Shops receives a most complete inspection and running test before it goes back into service. Below is one of the test racks for the air compressor motors, showing a converter and the control panels in the background at the left*

Aside from these problems there were others having to do with the electric locomotives. As has been mentioned previously, comparatively little was known about electric locomotive operation in high-speed, heavy-duty service. Some of these problems were:

1—The design of a locomotive to give satisfactory service on both 11,000 volts alternating current and 6000 volts direct current, from an under-running as well as an overhead third rail.

2—The equipment had to be so constructed that when the direct current zone of the New York Central was entered the pantagraph collector would fold down in as little space as possible.

3—When the alternating current zone was entered the third rail contact shoes had to fold up against the sides of the trucks closely enough to permit of ample running clearance.

4—Both pantagraph and collector shoes had to maintain constant contact with the conductors at all times and at high speeds.

5—The control system had to provide the main motors with resistance and series-parallel control on direct current and variable voltage control on alternating current.

6—Auxiliary apparatus, such as blowers, air compressors, headlights, lamps, etc., had to operate on both alternating and direct current.

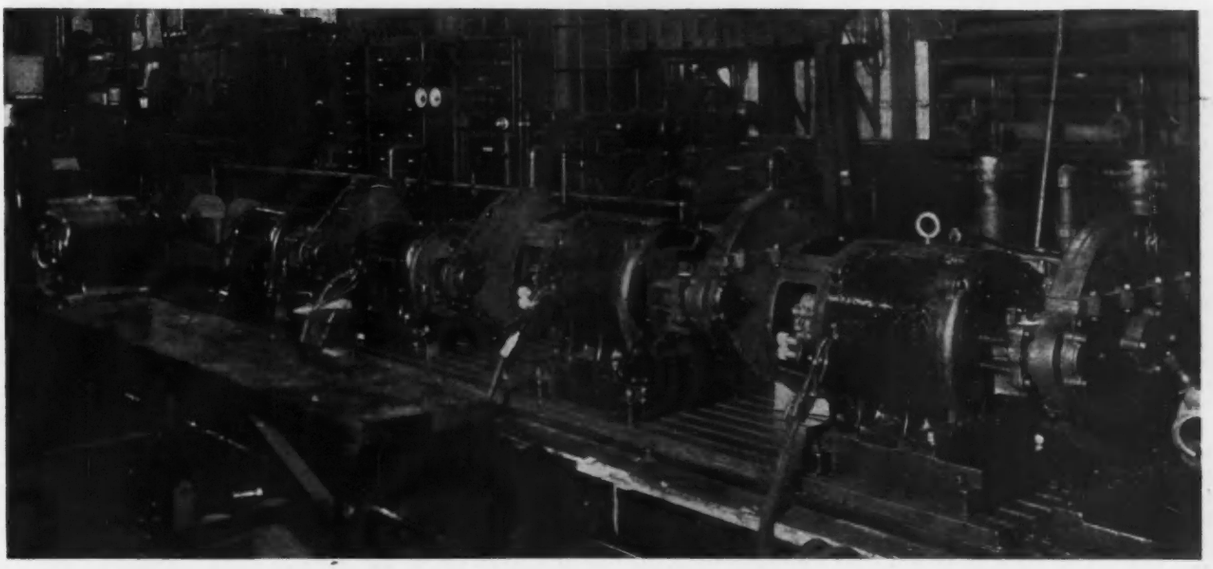
7—The change-over connection from one kind of current to the other had to be accomplished, insofar as was possible, automatically and with a minimum of manual operation. This was especially true on multiple unit trains, where, of course, the change-over had to be entirely automatic.

8—The control of auxiliary apparatus had to be effected by push buttons located at either end of the locomotive cabs and at either end of all motor and trailer cars, and by relays.

After the New Haven had electrified its lines from Woodlawn to Stamford it was decided to extend the zone to Cedar Hill, Conn., which is just beyond New Haven, as it was thought that unified operation of a single division would eliminate duplicate locomotive equipment and operators, double locomotive facilities and interchange facilities.

Electric operation to New Haven began in 1914, although at that time there was neither sufficient motive

(*Concluded on page 70*)



# Ready to Apply

*Nine liftable ideas for cutting costs or simplifying the day's work of the electrical manufacturer*

### Simple, But It Works

DIES are heavy, and consequently it has become fairly common practice to use caster-mounted tables for moving dies to and from machines. The tops of these tables are of such a height as to require a minimum of lifting.

But even at that there is in most cases a little lifting to be done, and, unfortunately, it is frequently at arms' length and at such a height as to cause possible trouble to a workman who has had a rupture or tendencies in this direction.

To remove every bit of this hazard one company has added to its die transfer tables an ingenious step, which swings back beneath the table under-structure when not in use.

When an operator stands on this step while transferring a die, he is in an advantageous position for safe lifting.

G. G. H.

### Where a Flexible Partition Works Well

MANY manufacturers of electrical equipment find it convenient to set aside one section of an already crowded shop floor for electrical welding purposes. Then comes the question of some sort of partition to keep the welding arc from blinding other workmen on adjacent parts of the main shop floor.

Often a solid partition is erected. But this has the obvious objection of making it necessary to bring the material to be welded in through a door at some fixed partition. Once in, it must then be maneuvered around into place—to the frequent disturbance of welding work already in process.

To avoid confusion of this kind, it is quite customary to make up several portable sections of partitions and stand them on the floor where required. And yet here the objection is that every once in a while a load of material being backed into position for admittance to the welding department bumps into the portable partition and knocks it over on to an operator within, with disastrous results.

After giving considerable thought to the matter, the Mercury Manufacturing Company devised an entirely different type of partition that seems worth describing, not only because it is amazingly simple and cheap, but because it does the trick better than anything else which this company has ever tried.

A long strip of canvas, rendered fireproof through special treatment, was attached to the ceiling and permitted to hang loosely to the floor. Now, when a load of material to be welded is despatched to that department, the workman backs it up to this curtained "dead-line" at whatever spot he desires. Should the load overrun the "dead-line" a bit in the hurry of backing it into place, the partition can only bulge a little until the workman brings his load to a full stop. There is nothing to fall over on any of the operators.

Thus the material is brought in under the canvas at the handiest spot. And likewise the welded job leaves the department in the same convenient manner.

Just another of those little shop "stunts." Yet the Mercury Manufacturing Company finds it effective yet simple. L. A.

### Use Both Hands for Safety's Sake

THERE has recently been installed on several presses at the Erie Works of the General Electric Company an improved method for tripping the press, the object of which is to eliminate the effort required for manual tripping and to decrease the hazard of press operation.

Two push buttons wired in series from the motor leads operate a solenoid controlled air valve. This valve when open allows compressed air to enter a small air cylinder, the movement of the piston of which operates the press trip level, releasing the clutch. Releasing either of the push buttons closes the air valve and allows the air in cylinders to exhaust to atmosphere (through the exhaust port in the solenoid air valve), which in turn releases the press clutch for disengagement.

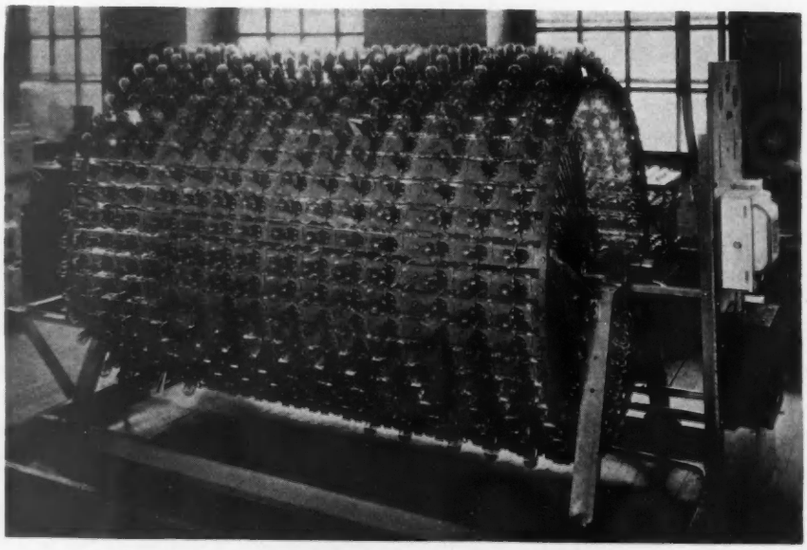
The solenoid air valve is provided with an exhaust port, which is normally open and allows any leakage of the air valve to escape freely to atmosphere, thus eliminating the danger of leakage inadvertently operating the tripping cylinder.

It should be noted that the operator must remove both hands from the danger zone, and place them on the push buttons, which are mounted on the punch holder or slide, the movement of which automatically serves as a warning to him that the press is tripped and in motion; further, since this device is wired into the motor circuit between the motor and starting box, it is impossible to trip the press with the motor out of circuit. W. D. O.

### Making Good Use of Floor Space

SPACE charges enter into production costs in a very real way, and that plant which takes this element into account proceeds wisely. And there are usually by-product gains which come from the greater concentration of production per square foot of floor space—gains by way of wasted motions and false steps on the part of workmen.

A very interesting application of this principle is apparent in a rotary machine in the Eveready Raytheon Tube factory, which automatically subjects each tube to from 9 to 15 different voltages and conditions. This machine is illustrated immediately below. W. B. T.



**A Revolving Radio Tube Testing Device**

*This mechanical testing device subjects tubes to from 9 to 15 different voltages and conditions in the course of their production in the Raytheon Tube factory*

## "Spotlighting" Errors

SUPPOSE you load several freight cars on your side track simultaneously and a day-dreaming trucker puts a case destined for Philadelphia on a Boston car. The probable net result is a customer disgruntled because of delay in receiving his goods and a lot of wasted time in straightening the thing out.

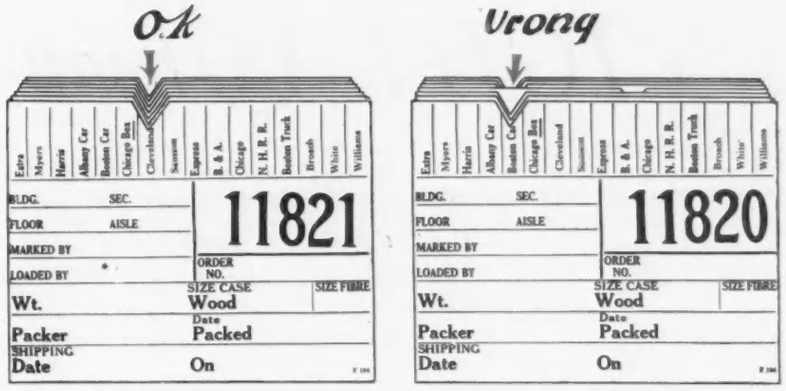
All likelihood of such an occurrence is obviated in a mighty simple way in one eastern plant. Just before goods already packed leave the conveyor, destined for the freight car, a clerk puts on top of the case a heavy card bearing along its upper edge a series of spaces in each of which is printed the route or means by which it is to reach its destination—as for example, Albany car, Boston car, Chicago car, Express, Boston truck, etc.

And before he places the card on a packing case he punches a V-shaped notch in the card along the upper edge opposite the route for which that particular box is intended.

Then before it leaves the conveyor line it is checked to see that it is properly punched.

When the trucker puts the case in a given car he places the card in a pocket adjacent to the car. At frequent intervals these cards are picked up and when this is done a mere glance shows whether all of the notches form a clear cut right through a pack of these cards. If not, some shipment is misplaced.

Since the man who picks up these cards does so rather frequently, any error is caught soon enough so that it is not necessary to unpack a whole car to find the misplaced shipment. H. C. K.




**Checking Shipments Is Simple With These Tags**

*Notches in such tags as these attached to shipments indicate their destinations, and when all of the tags for one car are assembled, it is easy to detect errors in loading*

## No High Hats Here

THERE is no private dining room for top executives only at the Master Electric Company as you see in so many manufacturing plants. Instead, they have a dining room for *all* executives.

There is one table where the chief engineer sits with his engineers, another for the superintendent and his foremen, and still another for the treasurer and the members of the accounting division. And the sales manager sits with those in the sales division of the business.

What better opportunity for "talking shop" than where that kind of conversation will find a definite expression in better methods and a better product.

L. I. T.

## Making Tarpaulins Serve Two Purposes

NOT always, even in plants where a good deal of attention is given to safety work, are proper precautions taken when it comes to maintenance painting activities. One electrical manufacturer has given this considerable thought and believes it has accomplished a good bit in this direction.

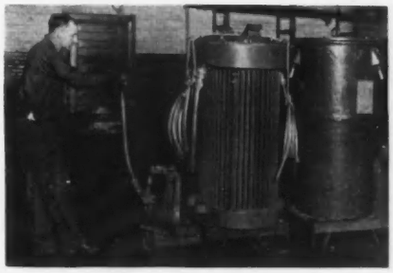
For example this company extends tarpaulins under the painters and over the regular factory employees while painting is going on, as is common practice, but where the painting is done in high places, tarpaulins are used which are specially made with rope reinforcements at frequent intervals so that they may be stretched securely and serve as safety nets.

The tarpaulins are of such a size that they cover a bay and overlap slightly into the next, which is of advantage where several adjacent bays are to be covered. Also this concern uses life belts for its painters wherever they are necessary.

L. I. T.

## Ready to Go

TO have "spares" and necessary materials instantly available is a large part of the job of the maintenance man in any electrical plant. How one company meets this situation as regards transformers is evident from the accompanying illustration.



Spare transformers are stored on skids. By shoving a lift truck underneath the transformers are accessible at a moment's notice. A. C. H.

## Simple Scaling to Get the Answer to Power Factor Problems

HERETOFORE the calculations relating to power factor and its improvement have been difficult for those most vitally interested, and at best did not visualize the conditions that might result from different treatments.

There is announced a new system of solving power factor problems which involves simple computations only. This is described in a new bulletin, which may be had without obligation by addressing the editors.

In brief, the new system consists of laying down to scale the known factors and then scaling the unknowns. Many problems are illustrated in the booklet, as well as several solutions for one problem, so that there should be no difficulty in applying the simple rules. Thus the effects and probable costs of improving power factor by unity-power-factor synchronous motors, by capacitors or by synchronous condensers, may be scanned and compared. Increased load-carrying capacity is readily measured and rearrangements suggests themselves.

All that is needed for computation is a scale, a pencil and paper. A right-angle triangle with the sides in proportion 3 to 4 to 5 is furnished with the booklet, and this, together with a small T-square, save time in the calculations and make the work more accurate.

In the actual calculations, horsepower at unity-power-factor is expressed in terms in inches, measured horizontally. Lagging power factor is represented by lines slanting upward to the right, and leading power factor, by lines slanting downward to the right. Where it is desired to improved lagging power factor, and to determine the amount of leading power factor necessary to accomplish this result, a triangle is laid out using the horizontal unity power-factor line and the upward lagging power-factor line. Then, by applying the 3-4-5 triangle, the necessary corrective value may be established. Other problems are solved in a similar manner.

*Perhaps you too have worked out little cost-cutting plans which are of value. If so, turn them in for use in this idea-exchange—a feature appearing each month in ELECTRICAL MANUFACTURING under this heading, "Ready to Apply". Ideas accepted will be paid for at a liberal contribution rate.*

# FIGHT Cheap Fixtures

*"If for one year manufacturers advertised to dealers only their best products and dealers featured only the finer examples of the fixture-maker's art we should find the average home spending as much for lighting a single room as is now spent for lighting the whole house"*

By CHARLES L. BENJAMIN
*Managing Director, Artistic Lighting Equipment Association*

IN a mid-western city a man—to all appearances an ordinary citizen, but in reality one of the city's richest men—entered an electrical store and said to a salesman, "I want a lighting fixture for my sun-porch."

This store has a good fixture department. Two of its several showrooms, display really good fixtures. But the salesman, without any question as to the kind of sun-room the customer wished to light—large or small, dainty and colorful, or of rugged simplicity—without a word that would elicit information to indicate the kind of fixture the customer should have—led him to the room where the cheapest fixtures are hung and, pointing to a bunch of strap-iron daubed with cheap enamel, said:

"There's a real bargain at $16."

The customer shook his head. "I wouldn't have that in my house," he said.

"Oh, you want something more expensive?"

"I want something better."

"How about this at $25? No? Well, let's go in the other room. Here's a beautiful fixture at $50. That one over there is $75."

The customer was paying no attention to the salesman. He had caught sight of a fixure that pleased him. "That's what I want," he said.

"That costs $150."

"I'll take it."

The clerk entered the sale. "Sale!" He hadn't sold anything. The customer took the fixture away from him.

Can you think of any other industry, except the lighting fixture business, where the worst products of the industry are habitually featured in advertising, showroom and sales talk? We produce lighting fixtures which in beauty of design, craftsmanship and finish are not surpassed by the products of any other nation, but we also produce the worst lot of cheap junk that any industry was ever cursed with, and instead of being ashamed of it, we spend good money to advertise it.

Try to find an advertisement of a really meritorius lighting fixture. Out of a hundred ads you will find only one or two that feature anything but the very worst products. Yet our country is the richest in the world. In the same newspapers that carry advertisements of "artistic floor lamps specially priced at $1"—"5-light chandeliers at $1 a light"—and "complete lighting equipment for a five-room bungalow for $12.50"—you will find advertisements of oriental rugs at $3,000, fur coats at $1,500, wing chairs at $95 and perfume at $65 an ounce.

Who buys perfume at $65 an ounce? A few rich people. Is cheaper perfume no longer sold? Oh, certainly; but the public that a few years ago thought $1.50 an ounce a stiff price for perfume has now been taught to think of this luxury in terms of $65 an ounce—a prohibitive price for most of us. But $6.50 an ounce formerly would have seemed an outrageous price. Now it appears quite moderate, having in mind the fact that you *can* pay ten times as much.

This is the Einstein theory applied to merchandising. All things are relative. If our price yardstick is adjusted to the $65 standard, $6.50 seems cheap. If it is adjusted to the $1.50 standard, $6.50 seems dear.

If for a single year lighting equipment manufacturers would advertise to the dealer only their best products, and dealers would feature in showrooms and advertising only the finer examples of the fixture-maker's art, we should find the average home-owner and building contractor spending for lighting equipment for a single room as much as they now spend for lighting fixtures for the whole house.

In every other industry supplying materials or equipment for the home the standard of quality has been raised. To the appeal of quality, convenience and beauty the American public is always responsive. How else can we account for the facts that in even the modest home hardwood floors have replaced pine flooring; that the tiled bathroom with porcelain fixtures is accepted today by the building contractor as an absolute necessity, and the only question is whether the house shall have one bathroom or two; that instead of building a woodshed we now build a garage; and that at a cost of several hundred dollars per family, modern homes are equipped with electric irons, clothes washers, vacuum cleaners and electric refrigeration. All these things indicate that the American family has money

Dollar Day Special
DISTINCTIVE
BRIDGE LAMPS
Finished in antique gold. Modernistic and artistic styles which find a place in any home. Very sturdy and steady. The shade is of decorated pleated parchment. Complete with 10-foot attachment cord.
$1

*EVER see a fixture ad like this? Slipping into slang "We'll say you have"—and many, too. Dollar Day sales are familiar almost everywhere, but let's be fair about this matter. Is it always the retail store which advertises cheap fixtures just for the sake of their cheapness? Does the manufacturer ever use this method?*

to spend and will spend it when convinced that the product is worth the price and will add to the comfort, convenience or beauty of the home.

What has happened in the lighting equipment industry? While other industries have been improving their products and getting a better price which enables them to make their products still better, the lighting equipment manufacturers and dealers, cursed with a low-price complex and regardless of the experience of other industries, have been engaged in a contest to see who can make and sell the cheapest fixtures. We have put all the emphasis on price and have taught the home-owner and building contractor to consider this alone. As a result you find in homes splendidly equipped in every other particular, selling for from $18,000 to $25,000, lighting installations disgraceful to our industry.

Who taught the home-owner and the building-contractor that $100 or less is enough to spend on lighting fixtures for the whole house? We did. Instead of picturing to our customers, as other industries do, a vision of what we could do for them if we had an adequate appropriation; instead of showing our best products in our advertising and showrooms; instead of having the courage to show in our catalogs as the manufacturers of bathroom equipment do—installations costing $1,000 or more—we either do not advertise at all or else feature fixtures from which it is no longer possible to derive either pride or profit.

Fixtures of beauty
Fixtures to suit you and the house you live in.
—Mr. Electro-serve.
THIS is the electrical fixture shop where you will be accorded expert satisfaction. We will install them for you and wire the house if it is in need of such electrical connection. You need to know us electrically.
SERVICE
STOVER
620 MAIN ST.
PHONE 609

*THESE ads do not feature cheap prices. They suggest quality. Such local ads, unfortunately, are in the minority*

Modern
FIXTURES
Our modern lighting fixtures are not only good looking but more . . . they are designed to light your home efficiently and artistically. A visit to our store will prove most profitable.
T. Nelson
Douglas

There is hope for the manufacturer or dealer who makes little or no profit on his work but can still take pride in it, for good work will eventually command a good price; but when we can no longer take an honest pride in our work it is high time that we shift over to some other line of business—the sooner the better for all concerned.

We have about reached bottom in this suicidal contest to see who can make and sell the cheapest fixtures. The only way of still further cheapening a lighting installation is to go back to drop-cords, and the home-owner and building contractor, in spite of their ignorance as to what constitutes a good lighting installation, would not be willing to do that. When one has for a long time traveled a road that goes down, and down, and down, a time comes when the road at last turns upward, and this upturn is now in sight for the lighting equipment industry. Conditions are going to improve because they cannot become worse. When we make and advertise and display better fixtures we are going to find that that is what the public wanted all the time.

There is no reason, except our own folly in emphasizing price, why the home-owner or building contractor should not pay as much for a lighting installation as for a plumbing installation; why one should not spend as much for the chandelier and brackets and portables for a living room as for the davenport, rug or radio. Is there anything that adds so greatly to the charm and comfort of the home as good lighting and beautiful lighting equipment?

We have made poor lighting installations the fashion while other industries have made good installations of their products the fashion. Every home-owner wants his house to be as good or better than his neighbor's house. If in his community a high standard of building construction and home equipment is customary, he will conform to the standard, or even improve upon it. If he finds beautiful lighting fixtures in his neighbors' homes, he will have beautiful fixtures, too. If they are content with poor fixtures, he will economize on his lighting equipment and spend what he saves there for something else. Each good lighting installation makes it easier to sell another good installation, and each poor installation confirms the home-owner in the belief that $100 is an adequate appropriation for lighting equipment for the whole house.

Suppose we could convince the builder of a $10,000 or $12,000 home that he should spend on lighting fixtures for his living room $150; for the dining room $100; for the entrance hall and stair lights $50; for the kitchen ceiling-light and brackets $25; for lighting equipment for the four bedrooms $100; and $75 for the porch lantern, bathroom fixtures and basement, closet and attic lights—or say $500 for complete lighting equipment. With that we could make a creditable installation—nothing elaborate, but distinctly good. Suppose we could make such an installation the standard for homes ranging from $10,000 to $12,000.

"Ah," you say, "if we could! But we can't."

I say we can. Other industries, whose products are not more important than lighting equipment, have done it, and so can we if we feature the better products and not the worst.

I say it can be done because it is being done. In the showrooms of some dealers you will find single chandeliers that sell for as much as $350, brackets at $75 a pair. Cheaper fixtures he may have, but they are not in evidence. The furnishings and decorations of the showroom are in keeping with the beautiful fixtures displayed. There is an air of elegance, good taste, that predisposes the customer in the dealer's favor.

This man, surely, should be able to suggest appropriate fixtures for one's home. Such dealers (would there were more of them!) do not find it difficult to sell $500 worth of fixtures to the owner of a moderately priced home. But for every such dealer there are dozens who hang a few cheap fixtures in a corner of a dusty shop where one on entering stumbles over a coil of BX, or a pile of conduit waiting to be taken out on a wiring job. You cannot sell good fixtures without the right background—the proper atmosphere—and so we find that the merchandising of the better class of lighting fixtures is gradually being taken over by the manufacturer himself, many of whom will tell you, very frankly, that the average dealer is no longer able to sell good fixtures.

It is useless for the dealer, under these circumstances, to complain that he is the "logical" distributor of the manufacturer. The logical distributor of any product in any community is the man who is best able to sell it in that locality. The remedy for this condition is for the dealer to become a better merchandiser of lighting equipment.

# When Should One Buy New Plant Equipment?

*A purchasing policy worth considering under which production apparatus must be justified before it is bought and also prove itself in a specified time*

By D. B. KIFT

*General Superintendent*
*Edison Electric Appliance Company*

LIKE most progressive manufacturers we have found it a wise procedure to put in mechanical aids in the form of special equipment of one type or another just as soon as we can show cost-cutting advantages sufficient to warrant it.

If we have done anything outstanding in this direction, it has perhaps been in the establishment of a single, definite overall policy to cover each and every situation. For the first few years under this policy we considered that the gains were great enough to warrant the purchase if it could be shown that the equipment would pay for itself out of the savings it would make in one year's time.

After several years we changed our policy to the extent of giving ourselves a year and a half instead of a single year in which to allow the equipment to pay for itself.

The reason for this lengthening of the time becomes evident after a little thought. It's no trick at all to get rich cream from the top half inch of the bottle. In other words, for several years after you adopt such a policy of equipment purchase you are easily able to spend all the money the directors will give you and still keep within the rule.

But after several years of operating under this policy, assuming, of course, that you have been given liberal financial assistance, you begin to run short of opportunities to qualify under the one-year-to-pay-for-itself rule. Then, rather than quit buying equipment and thus cease to progress, obviously the sensible thing to do is to extend the policy so that it will allow one and a half years in which to prove itself. At least that is the way we have looked at the problem and the course we have followed.

We have pursued this policy so intensively that we are now in the zone that allows still more time for equipment to pay for itself. There are some limitations, however, which I shall come to later on in my story.

When you start in consciously to follow such a policy of equipment purchase, it is truly surprising how many opportunities will present themselves under the time limitations you have set yourself.

Of course, I don't wish to imply that in starting such a plan we hired any group of people to put it through and to do nothing else. Nor did we jam the orders through all at once. We simply kept the policy and the opportunities which it implies ever in our minds and from time to time our regular organization took advantage of them as frequently as possible.

I have already implied that as the months go on and as the time limit is extended, new limitations arise. This is true and is due to the following situation: When a new item is added to the line of product it is quite likely to be found that this new item can be made at a considerably lower cost if certain new special equipment is purchased rather than to use the standard all-purpose machine tools already on hand. In fact, the savings of the new equipment over the old may easily bulk so large on the estimate that its purchase would seem warranted under the year-and-half rule, let us say.

All well and good *if*—and it is a large "if"—the new item withstands the ravages of style change and holds the public favor as long as a year and a half. So the reliability of sales estimates has to enter the problem. And it is an element which must be watched carefully. I have known of cases where it was easy to prove conclusively that new special equipment would pay for itself in a year, and yet the design of the product manufactured had to be changed in six months, so that the new machinery was "put on the shelf" long before it had paid its way.

So we take this element into full consideration in the working out of our purchasing policy. Our engineers keep in close touch with our sales department. Nor is it a hit-or-miss contact. The problem is discussed at regular stated meetings at which are present representatives of our manufacturing, sales and engineering departments.

If it develops that there is some doubt about the length of sales life of an item we go ahead and make it on standard equipment even if there is some added labor expenditure per piece. In other words, we purposely do not make it as efficiently as we know how, in so far as the operation itself is concerned, because after all the whole story as regards efficiency is not told until there has been completed the full cycle of money expended, way round to its return

(*Continued on page 68*)

## Making for Modernization

**IN keeping with the policy advocated by President Hoover, that industry do its utmost to make 1930 another banner year, plans are under way in many sections of the country looking toward the rehabilitation of manufacturing plants. In this connection The National Electrical Manufacturers Association and The Association of Electragists, Int., have appointed a joint committee to stimulate repairing of motor driven machinery and the substitution of high efficiency apparatus for obsolete equipment. This is modernization and those who are interested in this movement will find valuable information in this article on the subject of buying new equipment**

# *As the Editor Sees It*

# Now Is the Time to Modernize

By Stanley A. Dennis

THREE months ago American business witnessed one of the most disastrous crashes in the history of the stock market. What had gone up sky high came down like the old familiar ton of bricks. With a suddenness totally unexpected by the great mass of people, business slumped as if from a stiff blow below the belt, and for a moment it looked as if it would go down for the count. Dire predictions ran wild. Rumors and exaggerations of every kind and degree broke loose on every side. Traditional habits of thought, requiring that the headlong plunge of business must necessarily be followed by months of suffering and distress before it could again sweep upward, asserted themselves. An increasing army of unemployed and shrinking payrolls were confidently expected by those whose memories ran to other "panics" and who never dreamed that something new under the sun might happen. Many instances of distress and tragedy did come to light. It occurred to few people to ask whether the crash in stocks was the cause of the slump, or vice versa. But regardless of that question, it was inevitable that the terrific decline in security prices should be followed by reactions upon general business.

All the world knows what President Hoover did about it. It knows how he exemplified his own demand for initiative and courage. It knows how and why he called together in Washington four hundred of the nation's leaders; how he challenged business as a whole to tackle and solve a great national problem; how he organized business to offset the adverse developments in industry and commerce and finance; how he plunged into the difficult task of changing a bad national psychology into sound national confidence and a determination to ward off a period of economic depression. It knows how he encouraged the setting up of a vast construction program that should mean business and profits all along the line in 1930. Of course, the President has had his detractors, those who would belittle what he attempted to do and what he did, but the American people smile patiently at these human gadflies and go ahead.

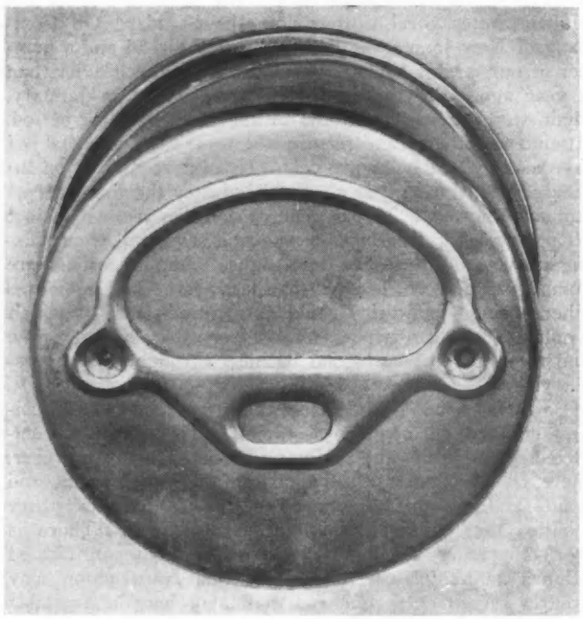
LOOKING back over the weeks that have passed since the President's conferences, it is evident that the determination of business to maintain employment and earning power and to retain its faith in the needs of more than one hundred and twenty million people have served immeasurably to shorten the business depression. Definite progress toward a better condition has been made. Through government action taxes due from 1929 have been cut 160 million dollars. Federal payments to states of quotas for road-building have been advanced by weeks. Public construction to the amount of seven billion dollars has been planned. Total placements of new bond issues in New York during one week in January were the largest of any week in history. During the past three months, the General Motors Corporation, the American Telephone & Telegraph Company, the Packard Motor Car Corporation and the Woolworth Company have all greatly increased the number of their stockholders—a very significant fact. The same is true of the United States Steel Corporation, the Standard Oil Company of New Jersey, the Pennsylvania Railroad and a number of our largest banks. Christmas trade ran heavier than a year ago. For the first and second weeks in January, chain store sales outran those of 1929 for the same period. Attendance at motion picture theaters exceeded that of last year by nearly 15 per cent. Gasoline consumption increased 13 per cent. In the steel industry the first half of January showed a 75 per cent capacity in use as against 50 per cent for December. And one steel mill is promising no new deliveries before August. Lumber orders are running 30 per cent heavier than last year. And numerous other business indicators could be mentioned, all of which would reflect the sharpness of recovery that is under way, and the expectation of good business throughout the present year.

So far so good. It is evident that a vast amount of business activity will open up as rapidly as plans can be completed. But while this planning is being done, however, there is every necessity for maintaining employment and wages and consumer buying power through the next three months, that is, February, March and April. There is work that must be done in advance of the anticipated summer building rush to the end that construction may progress at an even pace and that labor may be available at all times for the larger work to be launched later.

THE need of the hour is to modernize industrial and commercial buildings in every possible way. Repairs, replacements, maintenance, clean-ups and betterments of all kinds should be carried out immediately. When it is remembered that commercial and industrial building requires about 30 per cent of the total amount spent annually by the building industry, the importance of getting an immediate modernization program under way should be evident. Fortunately the money for this kind of construction work is supplied from the treasuries of industrial concerns, which can discount their paper through the banks. While this type of building is usually independent of the mortgage market, the cooperation of financial organizations of all kinds will make this industrial and commercial modernization much easier.

Certainly electrical manufacturing concerns will realize that this is the time to give careful study to improvements, repairs and expansions—to all kinds of building and equipment modernization work wherever it is possible. Herein lies the opportunity for large and small communities and large and small concerns to absorb any margin of employment while the larger business programs are getting under way.

# Plating Rolled Zinc and Zinc Base Die Castings



*An outline of the best recommended and tested plating practices with special reference to the cleaning of the surfaces of the work**

By E. A. Anderson, C. E. Rheinhard
*The New Jersey Zinc Company*

THE purpose of compiling the following information is to assemble, in as complete and concise form as possible, the data necessary for the practical plating of rolled zinc and die cast zinc parts.

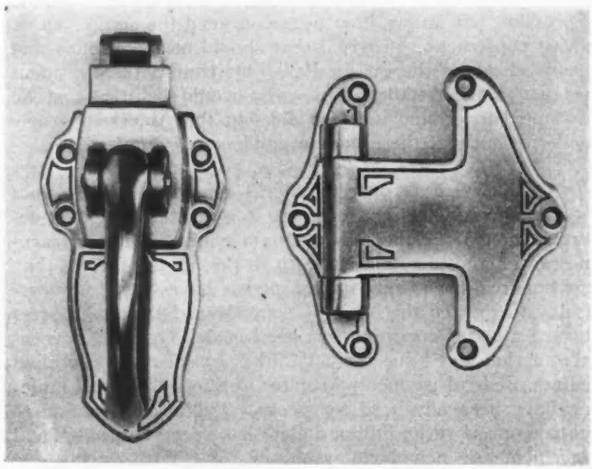
In preparing this information for the use of platers the methods described in the trade literature which are in successful commercial use have been tested, and the control necessary for the use of these methods has been determined. It has also been possible to discover certain small modifications of well known practices, which simplify the production of good plated coatings on zinc. Cleaning has been given particular attention, as many of the difficulties in plating zinc arise in this operation.

It is our belief that the plater will find nothing new or strange in the methods recommended, but will find facts of practical help in handling the increasing volume of zinc parts which he is asked to plate today.

The New Jersey Zinc Company will be glad to cooperate on any plating problems about which the reader does not feel entirely confident.

Rolled zinc may usually be prepared for plating by buffing and coloring. Die castings must be freed of parting fins and gate stubs. This is usually accomplished by specially constructed trimming dies or by grinding with the usual felt or canvas wheel to which is glued 180-240 mesh emery. In most cases where plating is necessary, the dies from which the casting originates are so designed as to produce pieces requiring very little trimming or grinding. Often a buffing with a rag wheel is all that is necessary before plating. It is obvious that the amount of work done on the casting before plating will to a large extent govern its appearance when finished.

Buffing is best done with tripoli on the ordinary loose-stitcher cloth wheels. It is essential, in the case of rolled



*Almost any type of zinc base die casting lends itself to finishing by any of the different methods of plating. Here are two illustrations of such die castings that could be finished in this manner. One at the upper left is a meter housing, and the other shows a type of hinge and lock or handle for an electric refrigerator*

*Abstracted from a bulletin issued by the New Jersey Zinc Company. In the compilation of the information contained in this bulletin, no consideration has been given to the possible effect of any patents which may be applicable to the methods or formulae recommended. The plater should develop this phase of the situation for himself.

zinc, that the tripoli used be free cutting, as excess pressure results in dragging and waviness. A peripheral speed of 5000 to 6000 ft. per min. seems best for this material. The r.p.m. to give this peripheral speed with various wheels are tabulated below.

| *Diameter of Wheel—Inches* | *R. P. M.* | *Diameter of Wheel—Inches* | *R. P. M.* |
|---|---|---|---|
| 4 | 5,250 | 14 | 1,500 |
| 6 | 3,500 | 16 | 1,300 |
| 8 | 2,600 | 18 | 1,165 |
| 10 | 2,100 | 20 | 1,050 |
| 12 | 1,750 | | |

In the preparation of rolled zinc, higher speeds have a tendency to cause "dragging," "warping," and "waviness." In the case of die castings, speeds as high as 2900 r.p.m. on a 14-in. wheel have been successfully employed in commercial operation.

Satisfactory coloring can be done with cloth wheels using a dry, soft white compound. This compound should be dry, as excess grease makes the cleaning difficult.

It should be pointed out that nickel, which is the most satisfactory primary coat in most respects, does not cover defects in the base metal and therefore the buffing operation must be satisfactory. Zinc buffs easily and ordinary care will produce a good surface.

## Cleaning

The presence of appreciable amounts of strong alkalies, such as sodium hydroxide, or of cyanides causes the darkening of zinc. Such discolorations greatly reduce the chances of obtaining perfect adherence of the primary coat. No cleaner which noticeably discolors the zinc should be used. Of the numerous cleaning solutions which have been systematically investigated, the following is by far the most satisfactory. It cleans thoroughly without discoloring the zinc. Tri-sodium phosphate ($Na_3PO_4$)—6 ozs. per gal. of water (45 grams per liter).

This solution is used boiling hot as an *electro-cleaner* with the article as the cathode and with sufficient current to cause gassing. Used in this manner it will completely remove, in ½ to 3 min., the grease normally present after coloring with a dry compound.

The cleaning solution may be removed from any minute holes or crevices in the surface of the article by alternate rinsing in hot and cold water.

## Acid Dip

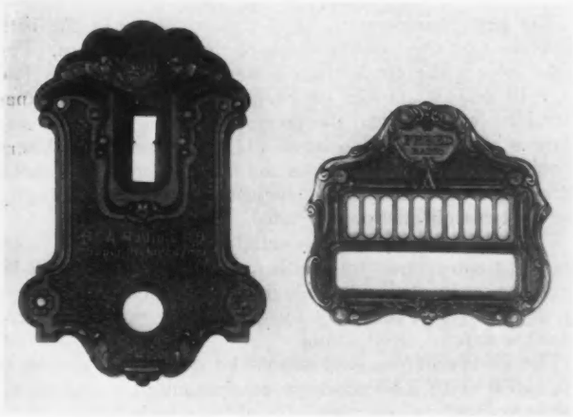
The use of an acid dip to slightly etch the surface and improve adherence is well known. While such a treatment is not essential, in the case of zinc, the additional guarantee of adherence which it gives renders it highly desirable. A one-minute dip, or until the surface has started to become matte, in a cold solution of one per cent of hydrofluoric acid will compensate for minor faults in cleaning and will aid in obtaining perfect adherence of the plated coating.

No rinse is needed after this dip unless a cyanide plating bath follows. In fact the acid carried over into a nickel bath aids anode corrosion.

A cold solution of 5-10 per cent hydrochloric acid is sometimes used for this purpose. This solution gives satisfactory results but has a slight tendency to discolor the zinc. Such discoloration is objectionable and, therefore, care must be exercised if the hydrochloric acid solution is used.

## Primary Coats

The problem of selecting a desirable primary coating for zinc and zinc alloys is somewhat complicated by the readiness with which certain metals dissolve in zinc. The use of nickel as a priming coat is recommended in every case.



Brass, copper, bronze, silver, and gold are readily absorbed. For example, at elevated temperature (100 deg. C.—212 deg. Fahr.) 0.0005 in. of copper, when applied directly over zinc, may be completely absorbed in ten days. It has been noted that under such conditions the adherence of metals plated over the copper is seriously affected. No information is available, however, as to the effect of the slower solution of copper at room temperature.

Copper, in common with other metals which must be deposited on zinc from cyanide solutions, requires very careful control to avoid blistering which may occur immediately or some time after plating.

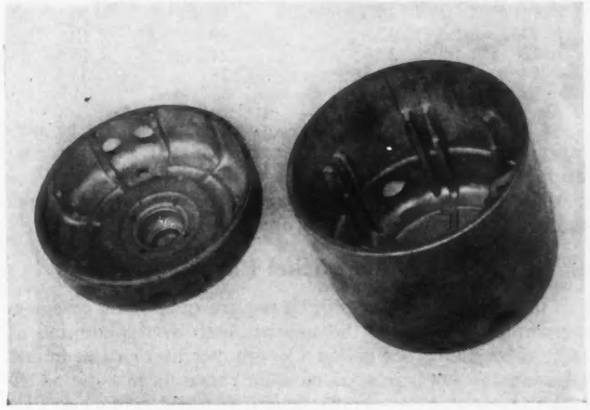
The use of copper or brass under nickel or chromium is also open to the objection that upon exposure the polished surface becomes coated with an adherent yellow tarnish. Contrast makes this tarnishing much more noticeable than the easily removed, light colored film which forms when only white metals are present.

The chief advantage of a copper flash seems to be in the ability of this metal to throw into small depressions in the surface. There is some question whether this advantage offsets the possible disadvantages.

## Nickel Plating

The high position occupied by zinc in the electro-chemical series makes the procedure of depositing nickel on zinc somewhat different from that employed in nickel plating brass and steel.

The introduction of metallic zinc into a nickel solution without any current flowing results in the formation of a black, spongy deposit of nickel. Some zinc goes into solution at the same time. The deposits formed are composed,



*Motor and radio manufacturers plate many of their parts made from zinc base die castings, such as the motor housing shown above and the radio cabinet escutcheons in the other illustration*

according to Thompson,[1] of nickel and zinc intermixed, and are quite useless as corrosion resistant coatings.

Three methods have been proposed for preventing this immersion deposition, (a) increasing the current density in a separate strike solution, (b) adding sodium citrate, and (c) adding sodium sulphate. The first of these methods is distinctly unsatisfactory. Some streaking invariably occurs even at the highest current densities and in any event the coatings produced are extremely hard and brittle.

The relative merits of the citrate and sulphate additions are open to controversy. While the citrate bath has been used commercially with some success, the higher efficiency, greater throwing power, and greater ease of maintaining the sulphate bath seem to render it the more desirable.

The following sulphate bath has been used with good success and is recommended for rolled zinc and zinc base die castings:

| | | |
|---|---|---|
| Single nickel salts | 10 oz./gal. | (75 gms./l.) |
| Anhydrous sodium sulphate* | 15 oz./gal. | (113 gms./l.) |
| Ammonium chloride | 1.75 oz./gal. | (13 gms./l.) |
| Boric acid | 2 oz./gal. | (15 gms./l.) |

*If hydrated sodium sulphate is used add double the amount.

The best concentration of sodium sulphate in the bath depends upon the size and shape of the articles plated. For a flat object the concentration may be reduced to as low as 8-10 oz./gal. (60-75 gm./l.) For complicated shapes streaking will occur in the recesses unless the sodium sulplate is raised to 15-16 oz./gal. (112.5-120 gm./l.) Where a number of different articles are being plated in the same tank the sulphate should be sufficient to prevent streaking in the most complicated object plated.

The sulphate bath operates satisfactorily with zinc when used at room temperature with a current density of 12-18 amp. per sq. ft. It is advisable in increase the *initial* current density to 30 amp. per sq. ft. for one or two minutes to minimize the danger of streaking.

The acidity of the bath should be controlled between a Ph of 5.8 and 6.2 by additions of ammonium hydroxide or sulphuric acid as required. Should the bath become continuously alkaline decrease the anode area, or vice versa if an acid condition persists.

With the current density held between the prescribed limits it is necessary to maintain the nickel ion content at 2.0 oz./gal. (15 gm./l.) The proper nickel ion content may be maintained by (1) regulating the anode area as suggested, and (2) by adjusting the chloride content of the bath.

The plating time may be reduced somewhat by increasing, the nickel ion concentration to 4 oz./gal. (30 gm./l.) the sodium sulphate content to 30 oz./gal. (225 gm./l.) and the current density to 15-30 amp. per sq. ft. The tendency toward streaking is greater in this bath than in the recommended solution, and requires much more accurate control of the plating conditions to secure uniformly good results.

Agitation of the articles being plated reduces porosity and admits the use of higher current densities. With certain shapes, agitation will be found absolutely necessary for successful plating.

In general, it has been found that good coatings having excellent corrosion resistance can be produced from the sulphate bath operated under the recommended conditions. Other than the effects due to size and shape there seems to be no essential difference between good plating practice for rolled zinc stampings and for zinc alloy die castings.

## Purification of Solution

Any plating bath used on zinc tends to accumulate zinc in solution. When the amount present reaches a certain limit streaking will occur as the result of the deposition of both nickel and zinc. Thompson states that streaky nickel deposits will be obtained on any base metal if the solution contains zinc. This difficulty is sometimes overcome by using small amounts of solution which are discarded when streaking occurs. This is unnecessary since zinc, together with other impurities such as iron, can be readily removed by the following treatment:

Heat the solution to 60 deg. cent. (140 deg. Fahr.) and add a small amount (1 oz./gal. or 7.5 gms./l.) of basic nickel carbonate. Allow the bath to cool overnight and filter.

This treament will remove practically all of the zinc, iron or aluminum which may have accumulated. The treatment will be required only at infrequent intervals. Attention should, of course, be given to the Ph value before again starting to plate.

## Nickel Stripping Solutions

The occasional defective platings which occur can be stripped preparatory to replating by immersion in the following solution.

| | |
|---|---|
| Water | 1 Part |
| Sulphuric Acid | 2 Parts |
| Nitric Acid | 1 Part |
| Hydrochloric Acid | 1/16 Part |

Prepare by adding the sulphuric and nitric acids to the water and after allowing the solution to cool adding the hydrochloric acid.

Where chromium and nickel must both be stripped this may be done in concentrated sulphuric acid using the article as the anode. Zinc is only slowly attacked by the concentrated acid but as the solution absorbs moisture from the air this attack will increase to the point where the solution demands attention. The excess moisture may be removed by boiling the solution until heavy, white fumes appear.

Stripped objects must be recolored before replating as the discoloration, resulting from stripping, will prevent perfect adherence.

## Thickness of Coating

The effectiveness of any plated coating depends to a large extent on its thickness. Experience shows that nickel coatings over any base metal should be at least 0.0003 in. thick to be really serviceable. Thinner coatings will not give satisfactory life in outdoor exposures.

The data given in Table I give the plating time necessary at any ordinary current density to produce a nickel deposit 0.0003 in. thick.

### Table I

**Time in Minutes to Produce 0.0003 Inches of Nickel at Various Current Densities**

| *Current Density Amps./Sq. Ft.* | *Time—Minutes* | *Current Density Amps./Sq. Ft.* | *Time—Minutes* |
|---|---|---|---|
| 8 | 46.0 | 18 | 20.5 |
| 10 | 37.5 | 20 | 18.5 |
| 12 | 30.5 | 24 | 15.5 |
| 14 | 26.5 | 28 | 13.5 |
| 16 | 23.0 | 32 | 11.5 |

As has been stated, nickel forms the backbone of corrosion resistance in any sequence of plated coatings containing this metal. For this reason it is undesirable to use a thinner nickel coating than 0.0003 in. even when chromium or another metal is used as a final coating.

## Bright Nickel Plating

A bright nickel deposit which requires no buffing or coloring can be produced in the sulphate bath by the addition of 1/60 of an ounce per gallon (⅛ gm. per liter) of cadmium sulphate. A few sticks of metallic cadmium may be added to the anode to maintain the cadmium metal content in use.

The deposits produced are very bright and smooth but somewhat brittle and should not be deformed or bent. Chromium should not be deposited over such coatings as

[1] M. R. Thompson—The Nickel Plating of Zinc and Zinc Base Die Castings—Trans. Am. Electro-Chem. Soc., 1925.

the additional stress will crack and peel the nickel.

### Black Nickel Plating

A bright, black, adherent coating can be obtained on zinc by a two-minute plating in the following solution at 45 deg. C. (113 deg. Fahr.).

| | | |
|---|---|---|
| Nickel ammonium sulphate | 8 oz./gal. | (60 gms./l.) |
| Zinc sulphate | 1 oz./gal. | (7.5 gms./l.) |
| Potassium sulphocyanate | 2 oz./gal. | (15 gms./l.) |

Current density, ½ amperes per square foot

### Finish Plating

The deposition of a substantial primary coating of nickel on zinc alters the problem of producing a finish coating. The surface to be plated is now no longer zinc but is nickel and the commercial processes commonly used for depositing chromium, brass, silver and gold, etc., over nickel may be used. While all of these solutions are well known they are recorded below for the plater's convenience.

Chromium, which is of major interest today, can be deposited with a bright finish over a nickel primary coat, using any of the successful chromium plating methods.

### Chromium

Satisfactory results have been obtained with the following solutions:

| | | |
|---|---|---|
| $CrO_3$ | 250 gms./l. | (33 oz./gal.) |
| $H_2SO_4$ | 2.5 gms./l. | (0.3 oz./gal.) |
| | or | |
| $CrO_3$ | 250 gms./l. | (33 oz./gal.) |
| $Cr_2(SO_4)_3$ | 3.3 gms./l. | (0.44 oz./gal.) |

No consideration has been given to the patent situation which must be taken into consideration by the plater.

Use at 45 deg. C. (113 deg. Fahr.) with lead anodes and at a current density of 75-150 amp. per sq. ft. A 3-6 min. plate will give satisfactory results over 0.0003 in. of nickel.

Care should be exercised in stripping defective chromium platings where zinc is the base metal. It has been found that a 20 sec. dip in concentrated hydrochloric acid at 50-70 deg. C. (125-160 deg. Fahr.) followed by an immediate rinse will remove the chromium. The nickel may then be buffed and replated. A stripping solution for removing both nickel and chromium has been described previously.

### Silver

Two solutions must be used in silver plating:

(1) *Strike Solution*

| | | |
|---|---|---|
| Ag CN | 5 gms./l. | (0.6 troy oz./gal.) |
| Na CN | 120 gms./l. | (16 oz./gal.) |

Transfer directly to the regular bath.

(2) *Regular Silver Solution*

| | | |
|---|---|---|
| Ag CN | 30 gms./l. | (3.7 troy oz./gal.) |
| Na CN | 34 gms./l. | (4.5 oz./gal.) |

Use both baths at room temperature with high purity silver anodes. The current density should be 3-5 amp. per sq. ft. for the regular bath and slightly higher for the strike solution.

### Gold

| | | |
|---|---|---|
| Metallic gold (as fulminate) | 2.1 gms./l. | (5 dwt./gal.) |
| K CN | 15 gms./l. | (2 oz./gal.) |
| $Na_2HPO_4.12H_2O$ | 4 gms./l. | (0.5 oz./gal.) |

Use at 60-80 deg. C. (140-176 deg. Fahr.) with pure gold anodes and at a current density of 1-10 amp. per sq. ft.

### Cyanide Copper

| | | |
|---|---|---|
| Na CN | 30-45 gms./l. | (4-6 oz./gal.) |
| Cu CN | 30 gms./l. | (4 oz./gal.) |
| NaH $CO_3$ | 7.5 gms./l. | (1 oz./gal.) |
| NaH $SO_3$ | 1.875 gms./l. | (¼ oz./gal.) |

Use at room temperature 45 deg. C. (113 deg. F.) with a current density of 10-15 amp. per sq. ft. Sodium Thiosulphate may be used as a brightener in amounts of 1-2 gm./l. or 0.12-0.25 oz./gal.

### Acid Copper

| | | |
|---|---|---|
| $CuSO_4$ | 180 gms./l. | (24 oz./gal.) |
| $H_2SO_4$ | 45-60 gms./l. | (6-8 oz./gal.) |

Use at room temperature with a current density of 10-50 amp. per sq. ft. Animal glue may be used as a brightener in amounts of ⅛ oz./gal. (or 0.9 gm./l.)

### Brass

| | | |
|---|---|---|
| Cu CN | 19 gms./l. | (2.5 oz./gal.) |
| $Zn(CN)_2$ | 8 gms./l. | (1.1 oz./gal.) |
| Na CN | 34 gms./l. | (4.5 oz./gal.) |
| $Na_2CO_3$ | 7.5 gms./l. | (1 oz./gal.) |

Use at 40-50 deg. C. (104-122 deg. Fahr.) with a current density of 4-5 amp. per sq. ft.

### Bronze

| | | |
|---|---|---|
| Cu CN | 34 gms./l. | (4.5 oz./gal.) |
| $Zn(CN)_2$ | 8 gms./l. | (1.1 oz./gal.) |
| Na CN | 49 gms./l. | (6.5 oz./gal.) |
| $Na_2CO_3$ | 7.5 gms./l. | (1 oz./gal.) |

Use at 50 deg. C. with a current density of 2-4 amp. per sq. ft.

The deposit obtained is not a true bronze. It resembles bronze in appearance only, being a high copper brass.

### Cadmium

Recent practice to improve the surface appearance of large die castings such as carbureters, fuel pumps, etc., which do not require a fine finish is to cadmium plate them directly without buffing. Satisfactory deposits may be obtained from almost any of the numerous types of solutions in use. A typical solution is:

| | | |
|---|---|---|
| NaCN | 7 oz./gal. | (52.5 gms./l.) |
| CdO | 3 oz./gal. | (22.5 gms./l.) |
| KOH | 2 oz./gal. | (15 gms./l.) |

No consideration has been given to the patent situation which must be taken into consideration by the plater.

Use at room temperature to 45 deg. C. (113 deg. Fahr.) with a current density of 10-25 amp. per sq. ft. Any of the recently patented brighteners will give satisfactory results.

### Testing the Properties of Plated Coatings

The outdoor exposure test is probably at present the only valid test of the endurance of a plated coating in service. Such tests when continued for twenty-four hours a day so as to include the very corrosive effect of early morning dew will yield results in a comparatively short time. Except in abnormally dry weather three or four weeks' exposure will yield surprising results in revealing inferior coatings.

In the salt spray test the articles are exposed at room temperature in a fine mist containing 20 per cent of common salt. This test when used for a plant control where samples plated under similar conditions with the same metals are compared serves very well the purpose of revealing defective practice.

There has been, however, a somewhat natural tendency to accept the endurance of a plated coating in the salt spray as an index of useful outdoor life. A little consideration shows that this cannot safely be done.

For example, cadmium and cadmium plated steel exhibit a surprising resistance to corrosion in the salt spray, as compared with zinc and zinc plated steel. In a variety of outdoor atmospheres, however, rolled cadmium and plated cadmium coatings have been found to corrode from three to four times as rapidly as zinc, and the conclusions reached on the basis of the salt spray test have been shown to be misleading. Many other cases exist where the results of the salt spray test are rather unreliable as a guide to the relative outdoor life of metals and metallic coatings.

It would not be fair to advocate the complete rejection of the well-known salt spray test, but it is important to point out that the useful life of any plated coating on any base should be determined first by actual exposure tests, following which the continuous quality of the production may be checked daily by means of this test.

# Coordinating Manufacturing and Delivery Schedules

*To make "Date Due" the same as "Date Delivered" is an ever present problem in every manufacturing plant. One plan for doing this is explained in the following*

By WALDO HUTCHINSON

NO PLANT, however small, can afford to neglect giving at least some close attention to "follow-up" methods, because without accurate information as to delivery dates and progress of work, a sales organization cannot give the exacting service demanded by customers in these days of keen competition and close prices.

The following outline gives a synopsis of a simple plan, which can be operated at small expense, for handling this problem.

After a comprehensive study of manufacturing and sales conditions, in a number of plants it was found that in order to achieve the coordination desired it was necessary to establish a system whereby orders for production were received from an order clerk in the office, and were distributed to the shop in a systematic manner and as systematically followed from start of production until the goods were packed and shipped. Included in this system were the following basic facts so necessary to secure the results desired:

1.—The proper route of orders for goods manufactured and the correct planning of schedules of production.

2.—The determination, as accurately as possible, of the delivery dates of goods and the keeping of the information constantly before sales managers.

3.—The securing of all materials necessary for a foreman to complete a given job and eliminating, as far as possible, all false moves in securing stock. Also allowing full time of foremen to the supervision of work in progress.

4.—After the determination of delivery date, the constant following up of jobs from start of work to completion and shipping, and the reporting immediately of delays in progress of jobs to sales managers.

5.—The interlocking of production and cost records.

6.—The knowledge at all times of the progress of all jobs running through the shop, so that shop and office executives are kept posted as to the existing production conditions.

In one plant, one man devotes his whole time to the work of equipment and personnel. He is a big caliber man, capable of winning the confidence of shop foremen and of helping and instructing them in planning production in their various departments. He has a wide knowledge of costs and methods of establishing operation lists and piece-work rates and tabulating these in such form as to be easily understood when sent to the cost department for incorporation into the cost records.

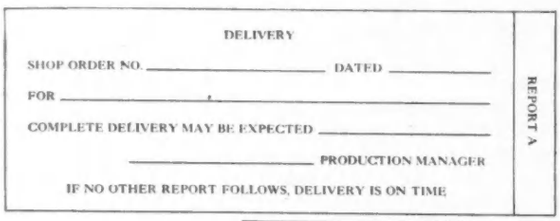
A competent stenographer who also has ability as a general clerk is his sole assistant. It was found advisable to take a new clerk and instruct her in her duties rather than take a clerk familiar with old methods and routine. A girl does this work as easily as a man and perhaps some detail phases of it better.

The production man has an office centrally located in the plant where the foremen readily seek him out if necessary, for advice, although in most cases the production man is called on the telephone and goes to the foreman, thus making it possible for the foremen to remain at their work.

Furthermore, the majority of problems the production man has to deal with are, of necessity, settled in the department and very frequently directly at the job where the question first arises.

The office equipment consists of desks for the production manager and clerks, and simple filing cabinets, a typewriter and a telephone with connections to all parts of the shop.

All production orders are issued by the order clerk in the office upon notification from the


DELIVERY

SHOP ORDER NO. _____ DATED _____

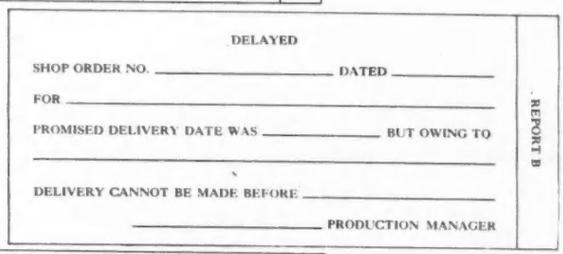
FOR _____

COMPLETE DELIVERY MAY BE EXPECTED _____

_____ PRODUCTION MANAGER

IF NO OTHER REPORT FOLLOWS, DELIVERY IS ON TIME

REPORT A


DELAYED

SHOP ORDER NO. _____ DATED _____

FOR _____

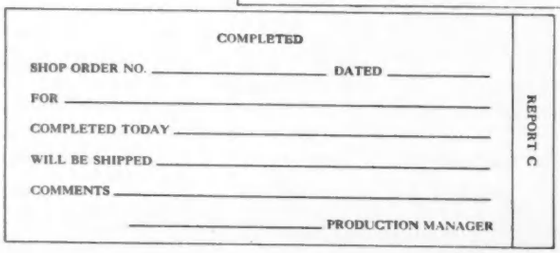
PROMISED DELIVERY DATE WAS _____ BUT OWING TO

_____

DELIVERY CANNOT BE MADE BEFORE _____

_____ PRODUCTION MANAGER

REPORT B


COMPLETED

SHOP ORDER NO. _____ DATED _____

FOR _____

COMPLETED TODAY _____

WILL BE SHIPPED _____

COMMENTS _____

_____ PRODUCTION MANAGER

REPORT C

*THREE simple forms that play an important part in the coordination of manufacturing and delivery dates. They keep manufacturing and sales executives informed at all times*

proper executives that goods are needed, and are sent direct to the production office in the shop.

Orders are in triplicate and the three forms are made up as illustrated.

As shown, the first copy is marked "Foreman's Copy," the second "Production Memorandum," and the third, "File," The paper used is of substantial quality, to stand handling. A desk letter basket, labeled "Incoming Orders," is placed on the production man's desk, and all orders are deposited in it when received from the office. These orders are sent once a day from the office—oftener in cases of special importance making necessary quick action to speed production.

## Fixing Date of Delivery

Upon receipt of orders from the office, the foreman's copy is signed by the production man and taken to the foreman in charge of that particular branch of the work. The production man at this time arranges with the foreman for the securing of stock. He goes to other foremen if necessary to obtain component parts. He also sets the delivery date of all goods named in the order.

Upon the return of the production man to his office, he dockets the foregoing information on the production-memorandum copy of the order, and places it on file under the date for that day.

The file copy has the information required for reference entered on it and copy filed by numerical order in another file as a cross-reference.

Production memoranda are filed in a cabinet having 31 divisions numbered from 1 to 31, which allows enough divisions for each day of the month. When the information is secured regarding delivery date, the production man files this memorandum under the date which he deems it will be necessary to follow up progress on goods called for. This date is usually some time in advance of the scheduled shipping date, because it is necessary for him to know progress and of any impending failure before delivery date, if at all possible.

This he repeats on each order and as many times for an individual order as is necessary to follow the order to completion. By this means an automatic "follow-up" is provided of jobs in process.

When an article is finally shipped the production memorandum is removed from the file and placed in an index arranged alphabetically according to various goods manufactured by the plant, thus providing another cross-index of shop orders.

FOREMEN'S COPY

DATE _____ ORDER NO. _____

ITEM _____

ROUTE _____

TO BE COMPLETED _____

_____ PRODUCTION MANAGER

FILE

DATE _____ ORDER NO. _____

ITEM _____

ROUTE _____

SHOULD START _____ SHOULD FINISH _____

COST CHECKED _____ BY _____

COMMENTS _____

*IF production is to be kept up to schedule it is important that factory departments and the production manager know at all times the exact progress of all work in the plant*

PRODUCTION MEMORANDUM

DATE _____ ORDER NO. _____

ITEM _____ PROGRESS

ROUTE _____

STOCK _____

WILL START _____

TO BE COMPLETED _____

REPORT "A" MADE _____

Now comes the question, how are executives advised of production conditions? After the delivery date has been set the production man fills out the form (Report A) and forwards it to the sales manager or any other executives designated. When the production schedule runs behind and the delivery date set cannot be met, Report B is filled out and sent to the same officials receiving the first notice, or Report A.

When the goods are finally shipped the form illustrated as Report C is forwarded by the production man to the officials who received Reports A and B, thus completing the cycle of information necessary to enable a sales manager to keep his customers fully informed as to the progress and reliability of delivery as scheduled of their respective orders.

On all costs figured or estimates of costs made by the cost department, a copy is sent to the production man, who checks and approves them. He then returns the cost sheet to the cost department, after which the cost of the job or the operation is incorporated with the permanent records of that department.

## Cooperation Is Essential

At the start of the system, and from time to time as necessary, the production man cooperates with the engineering department and establishes bills of material for all goods manufactured. These are made in permanent forms and copies are filed in the production and cost departments, as well as in the engineering department.

It has been found that if this is done when orders are issued for production, it is a simple matter to check the material needed for the job and it is also much easier to figure costs at the completion of the work, as there is a definite list of material to check against waste and spoilage as well as production.

The plan here given is a bare outline or skeleton plan for follow-up work. The various minor details have purposely been omitted. They can be designed to meet the necessities that may arise in each individual plant, and they should form a part of the general outline of work when the system is installed.

It has been found that with a production man in charge, there is no excuse for various clerks, foremen, and even salesman, running about a plant issuing conflicting orders, thus neglecting their own work and hampering production work in the shop.

While the production man's function is to keep all department heads interested and posted as to progress of work, he follows a general outline laid out by the one man who has entire supervision of the plant. He is responsible to him only, and only criticisms directed at the production department and having to do with schedules, go direct to the official to whom the production man is held responsible.

At the start of this system all foremen receive a notice to the effect that a new system is being started and that their cooperation is requested. Foremen are made to thoroughly understand that the production man's function is not to direct actual production, as that duty or right belongs to the foremen themselves, but he is to keep them posted as to what is expected from each department, match all departments' production together to produce the desired goods, and to see that raw material is ordered by the purchasing department for goods to be manufactured and to see that they arrive on time in sufficient quantities.

# Optimistic Note at Mid-Winter

*Said Mr. Collens:*

**¶ There is no indication that projects involving electrical apparatus and supplies will be held up.**

**¶ There has been speculation in stocks, but no speculation in business. Inventories are normal.**

**¶ Intelligent competition is entitled to all the facts which will eliminate all misunderstanding.**

**¶ Nema cannot and does not determine price levels, but Nema can be a form for discussing policies.**

**¶ Nema is making definite progress and can be of definite service to every one of its members.**

**¶ My hope is that each executive will so guide his business that competition will be sane and stable.**

INDICATIONS that 1930 will be a normally progressive year and that a business revival has already started were presented by speakers at the mid-winter meeting of the National Electrical Manufacturers' Association held in New York, Jan. 20-25. These views were given by Clarence L. Collens, president of the association, and Virgil Jordan, economist of *The Business Week*, at a general session held at the Westinghouse Lighting Institute on Jan. 21. At the same session the need for cooperative application of cost accounting to every industry was advocated by Thomas W. Howard, the association's director of uniform cost accounting.

A major part of the program of the convention consisted of meetings of many of the association's sections, particularly those devoted to electrical supplies. Numerous other committee meetings were held and a dinner party at the Hotel Commodore was enjoyed on the evening of Jan. 21.

"Business conditions are far better than they were in any previous depression since the war and it is fairly certain that the present recession will not go further," stated Dr. Jordan in his address. Current indications are that a revival will come more quickly than has been expected, he declared, and that it will be quite vigorous, but will not reach boom level at least until 1932.

He characterized the present recession as principally a reaction to excessive expansion in the automobile and steel industries during the first half of 1929. He declared that the effects of the stock market depression have practically been overcome. Signs of a revival, he continued, have appeared in the first two weeks of January in steel production, building contracts, coal production, car loadings and bank debits outside of the ten main stock-trading cities.

Abstracts of the addresses delivered by Messrs. Collens and Howard are presented below.

### *By* Clarence L. Collens

*President, Nema*

FUNDAMENTAL conditions are sound. The electrical manufacturing industry, during 1929, has enjoyed a prosperous year. In many of its branches business has been above what might be considered normal growth and development. Recession was under way and could have been expected entirely aside from whatever effect the sudden and unprecedentedly rapid deflation of the stock market may have had. Personally, I feel that the latter will have little effect during the year 1930 on our business as a whole, and that the year 1930 will be a return to normal in those lines which have been above normal during 1929.

There is no indication that projects involving electrical apparatus and supplies will be held up. In fact, there is every indication of some stimulation in such projects. By means of the Hoover conferences every effort is being made to renew building operations where these have been below normal and thorough cooperation between the financial and business interests should stimulate a normal building program for 1930.

In the industrial fields improvements and betterments and the modernization of plant methods and equipment may not result in business for the electrical industry which will reach the peaks of 1929, but it should be about half way between the levels of 1928 and 1929. The electrical industry, in the year 1929, started with good business, reaching high levels during the spring, was well maintained throughout the summer and a recession was evident in the early fall. The year 1930 will probably reverse this cycle. We are entering the year during a period of slight recession, which should be gradually overcome, probably with a return to normal in the early spring.

There has been speculation in stocks, but no speculation in business. Inventories are normal and no losses will have to be taken because of the deflation of inventory values. Hand-to-mouth buying has justified itself.

Some of you are wondering just what the business situation now is in your own branch of the industry. In very

**Clarence L. Collens**

# Marks Program NEMA Meeting

### *Said Mr. Howard:*

**¶ We insist on reliable figures of production costs to bring about the efficient factory operation.**

**¶ In every industry with which I have had contact there have been charges of price cutting.**

**¶ There are inherent difficulties in accounting for marketing costs. But are they insuperable?**

**¶ Price competition is detrimentally affected by the lack of accurate knowledge of marketing costs.**

**¶ We must attribute the high prices we pay to the unnecessarily high costs of marketing or distribution.**

**¶ It is no longer a day when judgments are made simply by intuition and without knowledge of conditions.**

**By Thomas W. Howard**

*Nema Director of Uniform Cost Accounting*

EVERYONE is interested in prices, and most of us are inclined to think that prices are too high. Hastily reviewing the processes of manufacture, and then of distribution from the factory to the consumer, we note the very concrete evidence of tremendous productive efficiency in our American factories. Thus, it is a natural conclusion that we shall attribute the high price that we pay to presumed unnecessarily high costs of marketing or distribution.

What, after all, lies behind the statement that marketing costs are too high? Is it not necessary that if the subject is to be discussed with any satisfaction there must be a comparison of actual costs with those that may be considered as standards?

We insist on reliable figures of production costs and the use of those figures to bring about the most efficient and economical operation of our factories. When it comes, however, to our distribution department we have an altogether different point of view. That point of view is controlled by our attitude toward the exigencies of price-making. I wish to raise the question as to whether we

few branches are adequate statistics being collected. In any competitive group, I am a strong advocate of intelligent, individual decisions, based on accurate facts regarding the business situation of the group as a whole. Decisions based on guessing never promote a stable situation. An executive who is either more pessimistic or more optimistic than the exact situation justifies loses out in either case; in the former because he adjusts his program for too little business, and in the latter because he overproduces and piles up inventory.

The electrical industry compares unfavorably with many other industries in detailed facts regarding the business situation which are available. Your president and Mr. Gerard Swope have been designated to represent the electrical manufacturing industry on the National Business Survey Conference and are expected at regular intervals to report on the business situation in the electrical manufacturing industry. A quick, general survey was attempted last November, but we have no means at the present time of obtaining regularly a comprehensive and accurate picture of the business situation in our industry. I will recommend to the board of governors that a plan be developed by which quarterly an exact record of the business situation in our industry can be obtained.

Never before was there a greater need of price policies which are simple, definite, easy of administration and easily understood by the purchasing public and by one's competitors. Secret rebates or secrecy regarding any of the elements which determine final cost to the buyer does not promote healthy, stabilized economic competition. Price schedules, the classification of customers, terms and conditions of sale and of all other factors which go to make up the price structure should be printed and distributed generally, not only to the public, but to one's competitors. Intelligent competition is entitled to all the facts which will eliminate guesswork, rumor, misrepresentation and misunderstanding, and which will permit of the intelligent conduct of each individual business.

Nema can fit into part of this picture. It cannot, and does not, determine price levels. The law of supply and demand and intelligent or unintelligent competition determines where price levels will be, but Nema can be a forum for discussing business policies. It can supply facts which will assist in the intelligent conduct of each individual business. It can promote codes and rules governing competitive practices and tending to eliminate unfair and unethical competition. I am convinced that it can indorse and advocate the principle of firm bidding.

Nema is making definite progress and can be of definite service to each of its members. But the initiative is a joint responsibility, both of Nema officers and management and of the individual executives in its various sections.

**Thomas W. Howard**

have not now arrived at a place where we can take a step forward toward methods of greater effectiveness and value.

At this point it is pertinent to inquire into the objectives in accounting for marketing costs. A few of these objectives are as follows:

(*a*) *To effect economies in individual items of marketing cost, such as advertising and salesmen's expenses. Such control is brought about through the use of a budget.*

(*b*) *To establish sales prices (or effect control of profits) through a knowledge of marketing costs of individual products.*

(*c*) *To supervise the profitableness of sales methods, sales territories, and possibly of individual salesmen.*

In every industry with which I have had contact, and especially those with which I have worked on production cost accounting during the seven years I have been identified with this work in the National Chamber of Commerce, there have been charges of price-cutting in the industry. It is a common complaint. Some of these charges, I know, are due to inaccuracy of statement as to prices that were actually quoted. In other words, there was no substantial basis for the assertion that there had been unethical cutting of prices. In some cases the presumption of price-cutting was caused by a comparison of prices on articles or products that were not identical in character. Then, of course, there are those cases of the cutting of prices wilfully and in the belief that such practice is sound policy in the conduct of business. Finally, there are those cases of erratic price quotation by those who may think they know their costs but actually do not.

## Accounting for Marketing Costs

IT is not easy to differentiate between these several groups, but I am convinced that a lack of knowledge of costs is a frequent cause of the quotation of prices that are upsetting to the competitive situation.

There are obviously inherent difficulties in accounting for marketing costs. But are these difficulties insuperable? Do they justify a failure to appraise them and through careful study to endeavor to develop practicable accounting procedure?

With the purpose of getting the views of others on this question, the United States Chamber of Commerce directed an inquiry to manufacturers' executives in more than 40 lines of industry.

Three questions were put before these executives. The first question was:

*Do you consider that you now have as reliable accounting control over your distribution costs as you do over your manufacturing costs?*

Fifty executives answered this question. A little more than half of them stated that they do consider they have effective control.

Examination of the answers indicated that all who said they have satisfactory control were thinking of the control that comes through the use of a budget system. Those who answered that they do not have satisfactory control included some who now have budgetary systems but do not find it possible to make as effective use of them as they do in the case of the budgetary control of manufacturing expenses. Others recognize the technical difficulties of apportioning marketing expenses to the costs of individual commodities.

The second question asked these executives reads thus:

*Do you consider that price competition in your industry is affected by the lack of sound knowledge of distribution costs as they relate to individual profits?*

The answers of 35 executives have been recorded. Two-thirds of these believe that this lack of knowledge does have its detrimental effects, while the remaining third thinks the opposite.

Referring first to those who answer that there are no ill effects from a lack of knowledge of distribution costs, the answers of several are interesting. One executive, for example, whose company is engaged in the manufacture of food products, suggests that many manufacturers in his line with a diversified list of products are taking what he describes as just profits on some items, whereas on others because of the keen competition they are not taking a just profit.

## The Cause of Price Competition

TWO-THIRDS of the executives, as stated, are of the definite opinion that price competition is detrimentally affected by the lack of knowledge of marketing costs. However, one of these executives has this to say:

*"Price competition in our industry may be affected by the lack of sound knowledge of distribution costs as they relate to individual products, but I feel that price in our industry has been in the past more affected by the lack of manufacturing costs than by the lack of distribution costs."*

Evidently this executive believes, and I am sure that he is not alone in the belief, that manufacturers have yet to learn something more of the costs of production.

The third question asked in this inquiry led the executives a step further into the technical field. This question read as follows:

*Do you believe that it is practical to develop for general application an accounting procedure for the costs of distribution that will result in their better control and in their effective use in the determination of selling prices and of selling methods?*

Thirty-three executives responded. One-third of these are skeptical of the possibility of the development of an accounting procedure such as suggested, while the other two-thirds believe that it is practicable. One executive in the abrasive industry in supporting his views of the desirability of the establishment of such practice writes thus:

*"I believe that all prices should be made on the basis of cost plus a reasonable profit, even though it is not always possible to get such a price. I know of no more effective means of stopping price cutting than definite knowledge that the price proposed will show no profit and probably a loss. In my opinion, most low prices are met because the concern that meets them feels that if some one else can make a price they can do the same and possibly a little better. A thorough knowledge of costs would prevent ideas of that kind."*

## Development of Accounting Procedure

POSSIBLY the most representative answer of those who are in favor of the development of uniformity of marketing cost methods is that of an automobile tire executive, who

*"Believes it possible to develop broad general principles of accounting procedure relating to the costs of distribution and to disseminate propaganda among industries to pay more and more attention to the question and to the use of costs in the determination of selling methods. The larger industries might well take up the problem through their respective trade associations. Conditions vary so much in different industries that it is hardly possible to lay down any standardized plan that will apply to all, other than to state general principles."*

Right-thinking executives wish to eliminate every practice that is detrimental to the conduct of business by the best ethical standards. But these business executives and their associates must be provided with accounting and budgeting systems and those other aids to management that will enable them to employ their native intelligence and ability to the best advantage.

I can simply say, in closing, that, in my opinion, every industry in this country can with profit undertake the cooperative or mutual study not only of production cost accounting but also of the cost problems found in the marketing of products.

# *Nickel Cast Iron* and Its Uses in the Electrical Industry

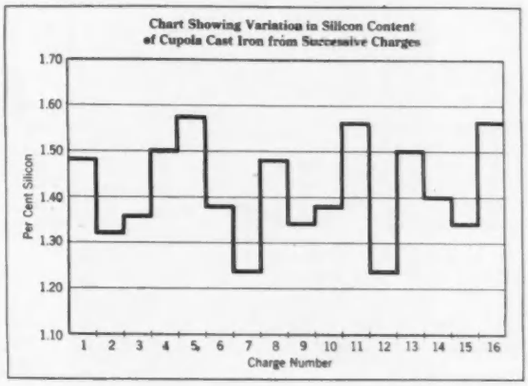
*Nickel cast iron, a foundry product, offers a solution to many problems of users of castings in the manufacture of electrical equipment*

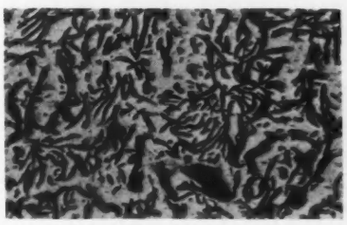
By William Crawford Hirsch

THE use of cast iron in the electrical industry is predicated on its structural and mechanical usefulness, and not on its electrical properties which may be summarized as being chiefly those of a comparatively poor conductor. Electrical efficiency of domestic appliances no less so than of heavy electrical apparatus depends, however, in a large measure upon the structural soundness of the product, and therefore the problems surrounding the use of cast iron are of major importance to the electrical manufacturer. Marked improvement obtained in the quality of steels by the addition of nickel led to intensive investigation of the benefits obtainable from its use in gray iron. The fruit of this research is a distinctive class of alloy foundry product; Nickel cast iron, which offers a solution to many problems in the manufacture of electrical machinery and domestic appliances.

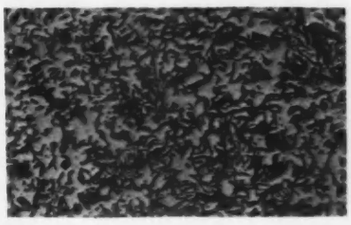
In the making of castings with light sections conventional gray cast iron has several outstanding disadvantages. Its susceptibility to chilled corners and edges seriously affects finishing operations. The control of the structural characteristics of ordinary gray cast iron in light sections involves many variables. Some of these it is virtually impossible to control within anything like the desired and sometimes rather narrow ranges. In ordinary gray iron foundry practice, normal fluctuation of the silicon content of the melt, which must be expected, may have a marked influence upon the structure of the cast iron. The silicon content depends on several factors which are difficult of control: the analysis of the pig iron, the blast pressure in the cupola, the melting temperature, and the moisture present. A variation in the temper of the sand molds or atmospheric conditions in the foundry may militate against the production of satisfactory light-sectioned castings. In the production of this type of castings it was found that the addition of a small amount of nickel, rarely exceeding 0.75 per cent, is a decided safeguard against these variations, the effect of nickel being similar to that of silicon in that it influences the formation of graphite, thereby rendering the castings gray and machinable.

Castings with chilled edges will reflect the presence of this chill to some extent, throughout the body of the casting, in brittleness, lower strength and inferior wearing properties. While the edges of a casting of this type show that they have been chilled, microscopic examination of the other portions will almost invariably indicate the presence of an abundance of free carbides or hard spots. Free carbides are inherently brittle, and when present in sufficient quantities, this brittleness undermines the usefulness of the casting as a whole. The presence of this undesirable constituent causes inferior resistance to abrasion due to the fact that the carbides frequently become dislodged in wear-

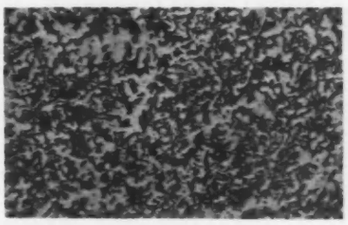


*No Nickel*



0.75 *per cent Nickel*



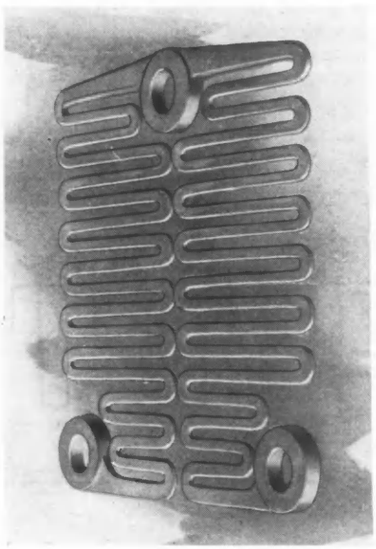
2.12 *per cent Nickel*

*Three photomicrographs showing the microstructure of cast iron having varying percentages of nickel added. The effect of nickel in refining the grain of the cast iron is clearly shown under a magnification of 30. These were made from arbitration bars of cupola iron containing 3.45 per cent carbon and 1.0 per cent silicon and are typical of nickel cast iron*

ing service and are deposited on the bearing surfaces on which they act as an effective abradant.

Nickel cast iron, while harder than ordinary gray cast iron, is relatively free of these localized, hard spots. The higher hardness of the alloyed material results from structural development or a building up of the metal body, rather than from the presence of an excess of free carbides. It follows, therefore, that this material is tougher, stronger, more readily machinable and generally better suited to the production of light-sectioned castings which must be finished or applied to service involving abrasive action and impact or fatigue stresses.

It is, however, not only in light-sectioned castings that nickel has proved its value as a general strengthener. The physical properties of ordinary gray cast iron frequently suffer when this material is cast in heavier sections. This is due to several causes which, however, may be summed up as "the sensitivity of ordinary gray cast iron to cooling rate effects." Slowly-cooled castings may be open-grained and porous in heavier sections due to an enlargement in grain size or to the development of abnormal graphite flakes or to a concentration of these. Several methods have been resorted to for improving the density of heavy castings, but none of these is entirely satisfactory. Prior to the

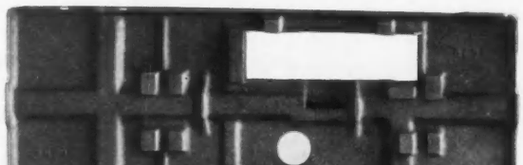


*Electric resistance grids such as that shown, and containing from 3 to 5 per cent nickel, are practically unbreakable in service and have more uniform electrical properties*

advent of nickel cast iron, the practice of pouring heavy sections against a chill was commonly in vogue, but while a certain degree of refinement in structure was attained by this method, a hard surface or skin on such castings invariably caused difficulty in machining operations. Castings of this type are now regularly produced with a small amount of nickel or suitable combinations of nickel and chromium which result in uniform density of the metal structure throughout, and offer no subsequent problem in the machine shop. It would be beyond the scope of this article to describe in detail the function of alloys in producing sound, close-grained castings, but it may be said that the use of nickel permits of the desired adjustment of the base mixture without a sacrifice of machinability. Combinations of nickel and chromium are used where it is not practicable to change the base composition.

A dominant problem in electrical equipment service arises from the constant vibratory stresses. Failure through fatigue is not uncommon, and it is in this connection that nickel cast iron offers decidedly attractive advantages. It has been found that resistance to fatigue of a properly alloyed nickel cast iron is approximately 50 per cent greater than that of ordinary cast iron. This feature is of especial importance in such parts as frames for motors and generators or in castings subjected to such service conditions. The greater resistance to fatigue of nickel cast iron is a corollary attribute of its higher strength.

Where service involves static, compressive or stresses other than those introduced through vibration, the higher

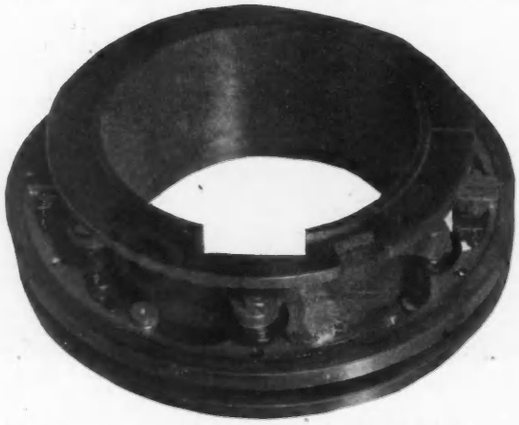


*Woodworking machine tables, prior to their production from nickel cast iron containing 0.75 per cent nickel, required six months' aging to eliminate danger of warping. Now they can be finished immediately after casting*

strength of special mixtures of nickel cast iron is also an important advantage. It is because of this characteristic that nickel cast iron finds wide use in such parts as spiders, wheels, end-plates, yokes, and rings in heavy electrical apparatus. This resistance of nickel cast iron to stresses which are factors in many domestic and industrial electrical appliances is opening constantly new outlets for the material. Where the strength of ordinary cast iron has been found adequate with the present design, considerable production economy results frequently from a revision of the design making possible considerably lighter sections with the use of nickel cast iron. Quite frequently the saving in shipping weight and the much more attractive appearance of a product are vital objects attained through the use of nickel cast instead of ordinary cast iron.

Wear-resistance is another valuable feature of nickel cast iron. This property is of the greatest importance in the selection of raw materials for many domestic appliances. A commutator ring serves to illustrate this feature. Due to its higher and more uniform hardness, nickel cast iron offers great resistance to the abrasive action of surfaces in moving contact. A particularly attractive feature in this connection is the fact that while nickel cast iron may be 25 to 40 per cent harder than common gray iron, its machining properties are practically the same as those of the ordinary cast iron of much lower useful hardness.

A higher nickel content: 3 to 5 per cent is used when toughness of the cast iron is one of the main objectives.

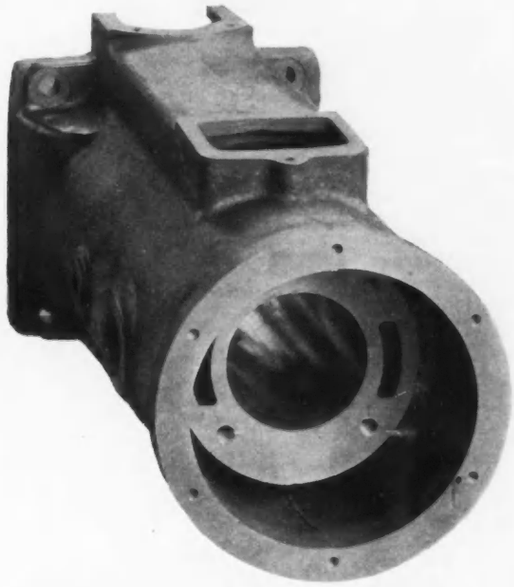


*Such devices as commutator rings like that shown above are more highly wear-resistant and are readily machinable when cast from a cupola mixture containing 1.25 per cent nickel*

This is shown by the use of such nickel cast iron in light electrical resistance grids which, having sections as light as ⅛ in., may be twisted through 180 deg. without failure. While the amount of nickel added to such castings is considerably higher than that required in the general run of castings used in electrical appliances, manufacturers of these grids have found the use of this higher nickel content in their castings highly economical. Breakage in cleaning, finishing, handling and shipping has been reduced sufficiently to more than offset the additional cost of the alloy. One manufacturer has found that the possibility of failure in service is so remote that a lifetime guarantee accompanies the grids.

Pressure tightness is a consideration with which manufacturers of domestic appliances are often concerned. Nickel cast iron has demonstrated its suitability for such service. It is close-grained, and pressure tightness is obtained without impairing the machining properties of the material.

Another advantage possessed by nickel cast iron is that it insures freedom from warpage in castings having both heavy and light sections. It is common in castings of this



*Pressure castings or intricately cored castings are produced from nickel cast iron with uniform density, and offer the advantages of being easily machined*

type to find that internal stresses which are released only during the finishing operations add to the difficulty of the latter. Frequently it is necessary to age such castings of ordinary gray iron for a period of upwards of six months in order to overcome internal stresses. The uniform structure of nickel cast iron, irrespective of section size, has been found to eliminate the warpage or distortion factor.

In addition to the electrical uses for nickel cast iron previously mentioned, it is an ideal material for conduit boxes, flange fittings, covers, transformer and switch cases, and brush boxes. In exterior lighting standards special mixtures offer added resistance to atmospheric deterioration. In the case of fans, the ability of nickel cast iron to overcome vibratory effects is especially valuable. The chief use for castings in domestic and industrial electrical appliances is, of course, in bases. It has been found that the base of an electrical appliance has far more to do with its serviceability and length of life than was generally supposed in the earlier days of the industry, and it is no longer looked upon as a part for which any old material will do.

One of the striking features of metallurgical development has been that progress through the judicious use of alloying agents and heat treatment came along the line of making good steel better while for years the vast opportunities of-

*Small air-cooled compressor cylinders containing 0.75 per cent nickel have a uniform high hardness and good wear resistance on cylinder bores, and the light cooling fins are gray throughout*

fered for improving the quality of such ordinary products as those of the iron foundry were neglected. A decided change is now taking place in this direction, and nickel cast iron is the first achievement by way of making possible foundry products that conserve the economies of gray iron without being heir to the many shortcomings which for a time caused other ferrous products to steal a march on them.

In general it has been found that the addition of varying amounts of nickel to cupola cast iron has the effect of giving the mixture the advantageous properties of strength, close grain and a hardness, free from localized hard spots, that makes this material easily machined, all of which are desirable features in the construction of electrical apparatus.

*An intermediate blower case for a stationary vacuum cleaner. The use of 0.75 per cent nickel eliminated chilled edges in webs and prevented cracking at junctions of heavy and light sections*

# Facts, Figures and Trends

## Domestic Power Consumption Increases

A marked increase in the average consumption of domestic electric current with a very little increase in the average annual bill is one of the outstanding characteristics of the history of the light and power industry for the year 1929.

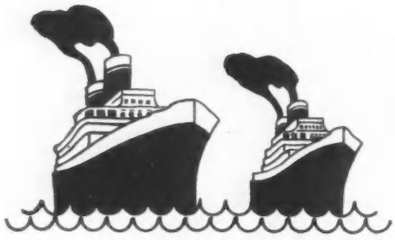
For the twelve months ending Jan. 31, 1929, the average annual consumption was 459 kilowatt-hours, the average annual bill was $30.10, and the average revenue received by the light and power companies was 6.51 cents per kilowatt-hour.

By March 31 the average annual consumption had jumped to 467 kilowatt-hours, the average annual bill was $30.00, and the average revenue had decreased to 6.43 cents per kilowatt-hour.

By Oct. 31, 1929, the average householder was using 492 kilowatt-hours per year, was paying an average annual bill of $30.70, while the companies were only receiving a revenue of 6.24 cents per kilowatthour.

## Electric Exports Gain

The value of exports of electric equipment for eleven months ending Nov. 30 reached $137,130,971, a gain of $36,656,968 over the corresponding period in 1928, according to the Department of Commerce.




An increase during November was largely accounted for by the expanding market for radio apparatus, exports of this class showing a gain of $1,410,916 for that month. The Canadian market was the most important outlet, although some of the South American countries, particularly Argentina, offered fairly good markets. Exports to Mexico and Italy also increased. Shipments of electrical refrigerators during November showed a gain of $212,639 over the previous year.

Exports of electrical equipment during November amounted to $13,648,437, an increase of $2,696,731 compared with the corresponding month of the previous year.

## To Start 70,000 Volt Transmission Line

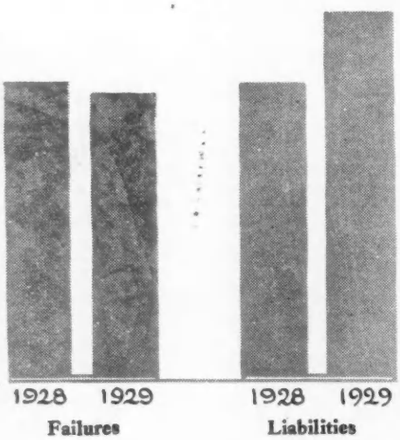
The first long step toward making the vast water power resources of the Hammarsforsens Power Company available to the Swedish wood pulp companies acquired a few months ago by the Kreuger & Toll Company, will be taken shortly when the power company begins construction of a 70,000 volt transmission line which will make possible the delivery of current 186 miles from its source. The plan is announced by cable from Stockholm. The construction of this long distance line is described in the advices from Stockholm as a solution to the national problem of transferring electric energy from the big northern power sources to the southern centers of industrial activity.

## Cost of Electrical Distribution

One of the most important items in the cost of electric service is the cost of distribution. Approximately 60 per cent of the total capital investment is in the equipment necessary to deliver the current from the power house to the customer's back door. In addition to the wages of the dollars invested in the lines themselves, there is the cost of operating and maintaining the lines as well as the cost of meters, meter reading, collecting, bookkeeping and everything which goes to make up the distribution of a commodity once it has been manufactured.

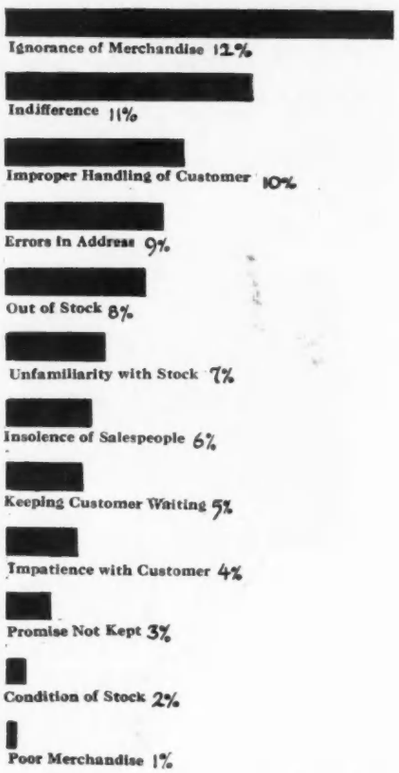
## Failures and Liabilities

During 1929 there was a total of 19,703 failures with liabilities amounting to $628,990,663. These figures represent a decrease of 3.2 per cent in failures but an increase of 21.4 per cent in liabilities as compared with 1928. This excess of liabilities over 1928 is attributed mainly to the increase in the number of bank suspensions. The December, 1929, failures were the largest since January of 1929 and were 9 per cent over December, 1928, while liabilities for that month were 45 per cent over the same month of 1928.




## Analysis of Lost Retail Sales

Retail salesmen's inadquate information on the merchandise they sell was found responsible for one-fourth of the 200 losses of sales analyzed in a Mid-West store. Salespeople were held responsible for all except 23 of the 200 lost sales, only the reasons, "Out of Stock," "Condition of Stock," and "Poor Merchandise," not being assignable to them.




## Index of Commodity Prices

The January 1 index of commodity prices as compiled by Bradstreet's indicates a lowering of the general level. The index of 96 articles studied was at $11.6795, a decrease of 4.5 from December 1 and a decrease of 9.7 per cent from January 1, 1928. During the month ten general groups decreased, two advanced and one remained unchanged.

## A New Interior Lighting Method

Colorama, or "painting with light," was introduced to a distinguished gathering of lighting engineers, interior decorators and scientists when, under the auspices of the Illuminating Engineering Society, the great ballroom of the St. George Hotel in Brooklyn was decorated with this new type of lighting recently.

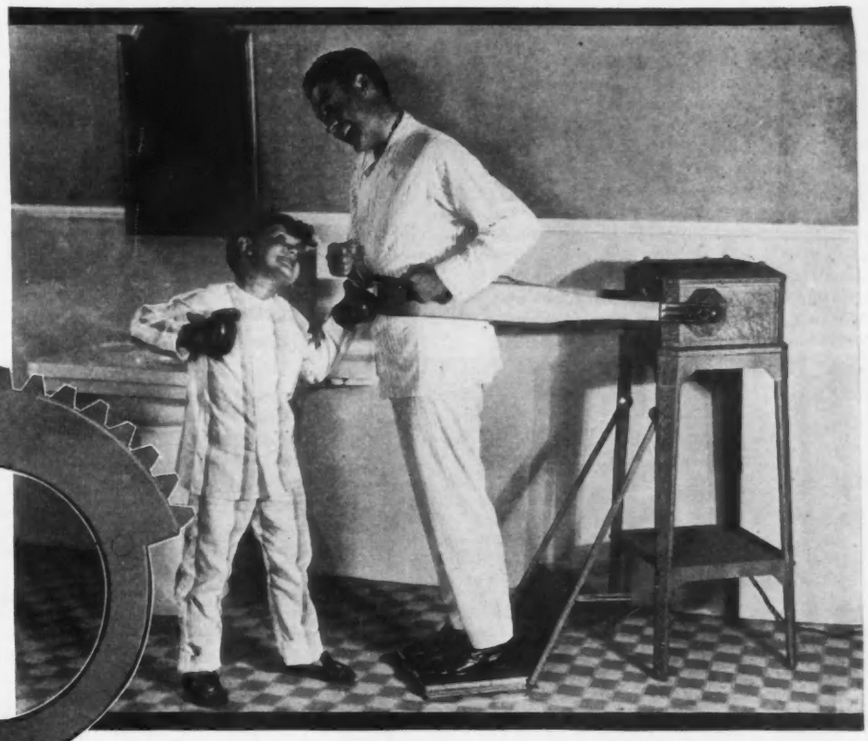


*Illustration shows Burdick Exerciser in use. The Burdick Corporation, Milton, Wis. is the world's largest exclusive manufacturer of Light Therapy Equipment.*

*This die cast control lever, with worm gear segment, governs the speed and stroke of the Burdick Exerciser.*

# A Challenge from Burdick *results in Mutual Victory!*

LOWER costs and fewer operations were taken for granted! The big problem was whether or not a worm-gear segment could be successfully die cast as an integral part of the control lever which governs the speed and stroke of the Burdick Exerciser.

Milwaukee Die Casting Engineers said it could be done and were challenged to prove it. In less time than expected, they created a unique die in which this difficult part could be economically produced and yet meet the exacting specifications of Burdick Engineers. They have since registered their complete satisfaction, not only with the casting itself, but with the close personal cooperation of the Milwaukee organization in working out the problems involved.

If a part of your product presents unusual problems of cost, production or design, do not consider it hopeless for die casting, until Milwaukee Engineers have had opportunity to pass judgment. Their intimate knowledge of unusual and difficult die casting applications is available to you at no cost.

## 6 *Costly Operations Eliminated*

By die casting this control lever, the following operations were eliminated:

1. Machine facing of gear tooth radius.
2. Machine facing the sides of the worm-gear segment.
3. Hobbing of teeth in the segment.
4. Boring large hole.
5. Drilling small hole.
6. Machining slotted hole and groove for speed indicator.

This part was formerly made of brass, cast in sand.

MILWAUKEE DIE CASTING COMPANY
289 FOURTH STREET MILWAUKEE, WIS.

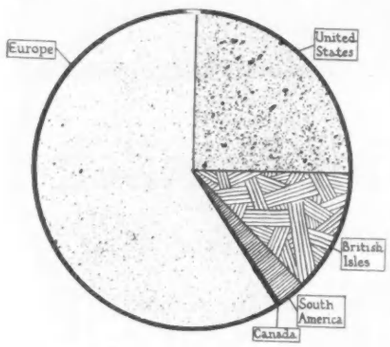
MILWAUKEE
DIE CASTINGS AND BEARINGS

The ballroom, one of the largest in the country, has a clear ceiling height of 29 ft. and 6 in., has an unobstructed floor area of 9500 sq. ft., and is without windows or visible ceiling or wall lighting fixtures. The entire room is painted in a flat white finish to serve as the "canvas" upon which a master artist paints the room's decorations—solely with lights. A hundred thousand variations of colors and patterns are possible with the system of decorating. The designs and colors may remain fixed or move according to any predetermined plan. Thus the ballroom may be a cool, light green and blue for luncheon, white and amber for afternoon bridge, or in deep rich, formal reds and browns for an evening banquet.

## Europe Now Leads World in Railway Electrification

In spite of the early start made by the United States in the electrification of railways, the continent of Europe is now far ahead of us in this respect.

Electrification of railways started in this country as early as 1895, and by the end of 1928 1,753.32 miles of all roads were electrified. In direct contrast to this, Europe, excluding Soviet Russia and the British Isles, had practically no electrified railroads prior to 1915, but at the close of 1928, 4,996.33 route miles were under electrification. To this figure may be added 1,019.12 miles electrified in the British Isles. On our own continent Canada adds 92.16 and Central and South America 566.3 miles to the total for North America.




## Per Capita Income of the Bread-Winners Reported

In a preliminary report analyzing the national income, the National Bureau of Economic Research states that the average per capita income for all inhabitants of the United States amounted, in the year 1928, to $749. When the non-earning element of the population is eliminated from the calculation, it is found that the average person working for a money return receives an annual income of $1,898.

## Copper Wire Exports

Foreign shipments of bare copper wire during August increased by $53,550 over the corresponding month of last year, and the eight months' trade ended Aug. 31 registered an increase of $574,752, according to a recent report of the electrical equipment division of the Department of Commerce. Sweden was the largest purchaser of this material in August, exports to that country amounting to $41,258. Mexico and the Philippine Islands each took approximately $25,000 worth; Newfoundland and Labrador imported $19,935 worth, and Argentina $18,329 worth.

Exports of insulated copper wire and cable, on the other hand, showed a decrease of $17,114 for August, although the eight months' trade ended Aug. 31 registered an increase of $1,171,527.

## Four Giant Electric Generators for Russia

Four 77,500-kva. hydroelectric generators, among the largest in the world, are being manufactured for the Dnieper River development at Kichkas, near Zaporozhe, in the Ukraine. The development will supply power in the vicinity of Dnepropetrovsk, and through the southern part of the Union of Socialist Soviet Republics.

The total weight of each generator will be approximately 1,760,000 pounds, while the weight of the rotor and shaft will approach 980,000 pounds. The maximum diameter is approximately 42 feet, while the generators will have an overall height of 40 feet, 5 inches, of which 17½ feet will extend above the floor of the plant.

Large castings have been eliminated by the use of fabricated welded construction.

## High Cost of Labor Turnover

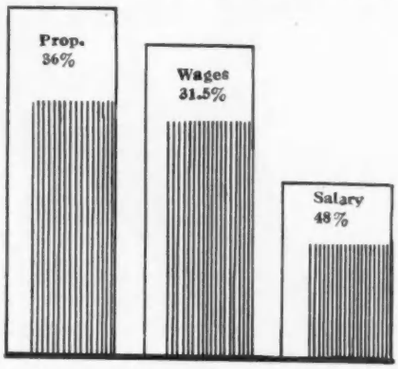
The United States Commissioner of Labor Statistics is authority for the estimate that the annual labor turnover of probably 40 per cent for workers in all lines taken together involves 5,200,000 persons each year. He points out that the two weeks estimated as the average time elapsing between jobs is the equivalent of full time employment for 200,000 people. The cost of retaining, in addition to the cost of spoiled material, is estimated at approximately $52,000,000 a year and the loss in wages at well over $300,000,000.

## Developments in High Tension Transmission

During 1929 much progress has been made in the solving of problems in connection with the use of high voltages underground. In other words, the engineers have been working on mass distribution in congested areas where the distributing lines must be put underground in spite of the fact that underground construction is much more costly than overhead construction. The use of 132,000 volt cables has been proven in. This means that the generation of electric current may continue to be concentrated in great central plants with a consequent lowering of both production and distribution costs and, therefore, a reduction in rates.

## Distribution of Wages

Employes—wage and salary earners—get 57 per cent of the national income, according to a new analysis by the National Bureau of Economic Research. Total realized income in 1928 is put at $89,419,000,000,




of which $32,296,000,000 went in wages, $17,823,000,000 in salaries and $1,065,000,000 in "pensions and compensations." Proprietors' share was $38,296,000,000. Salary income has increased 48 per cent in the last six years, proprietors' 36 per cent, and wages' 31.5 per cent.

**Motors, Motor Parts and Supplies—Production by Number and Value: 1921 to 1927, According to the Biennial Census of Manufacturers for 1927**

| | 1927 | 1925 | 1923 | 1921 |
|---|---|---|---|---|
| Motors, motor parts and supplies, total value | $122,348,338 | $113,109,577 | $109,188,685 | $74,446,738 |
| Stationary motors, total value | $97,672,987 | $92,647,851 | $84,777,710 | $58,078,493 |
| Fractional horsepower— | | | | |
| Number | 3,045,659 | 2,288,348 | 1,994,931 | 992,620 |
| Value | $33,902,719 | $28,249,265 | $23,939,172 | $16,906,738 |
| One horsepower and over— | | | | |
| Direct current— | | | | |
| Number | 65,038 | 77,737 | 59,256 | 39,072 |
| Horsepower | 628,044 | 635,130 | 533,394 | 415,419 |
| Value | $15,627,962 | $15,796,626 | $13,865,447 | $9,357,953 |
| Alternating current— | | | | |
| Polyphase induction— | | | | |
| 200 horsepower and under— | | | | |
| Number | 355,133 | 289,916 | 296,519 | 168,195 |
| Horsepower | 3,149,075 | * | * | * |
| Value | $34,684,913 | $34,908,246 | $35,586,235 | $20,752,924 |
| Over 200 horsepower— | | | | |
| Number | 1,240 | 1,246 | 1,045 | 1,442 |
| Horsepower | 410,980 | 464,316 | 405,738 | 470,993 |
| Value | $3,149,659 | $2,713,797 | $1,917,553 | $4,958,476 |
| Single phase— | | | | |
| Number | 100,192 | 76,688 | 53,227 | 40,659 |
| Horsepower | 173,605 | * | * | * |
| Value | $5,623,471 | $5,670,586 | $4,417,802 | $2,917,644 |
| Synchronous motors— | | | | |
| Number | 2,442 | 1,985 | 2,588 | 707 |
| Horsepower | 636,753 | 931,514 | * | 641,470 |
| Value | $4,684,263 | $5,309,331 | $5,051,501 | $3,184,758 |
| Railway and vehicle motors, not including automotive starters, value | $10,528,483 | $7,514,547 | $10,586,043 | $6,974,247 |
| Motor parts and supplies, value | $14,146,868 | $12,947,179 | $13,824,932 | $9,393,998 |

*No comparable data.

# FITTING EVERY-DAY HOME UTILITIES *to the average housewife's pocketbook*

PRODUCTION economies brought about by Stewart Die-Casting measurably reduce costs, give added strength and finish.

Stewart engineers take a complicated machine tooled part, simplify its design, prescribe a test proof alloy, and apply the die-casting process. Aluminum ware, once sand-cast, is die-cast to an even thickness, possesses greater strength and finer finish. A complete vacuum cleaner housing is produced in two halves, measurably reducing its cost without sacrifice of quality.

Frequently one Stewart casting replaces an entire sub-assembly, so expert are Stewart specialists in the application of products to production as die-castings. Behind this process stands a complete staff of engineers, metallurgists, craftsmen, and modern machinery, ready to serve you.

A word from you brings a Stewart engineer to give personal attention in regard to your die-casting requirements, or why not send blue prints or samples for quotations today?

Stewart

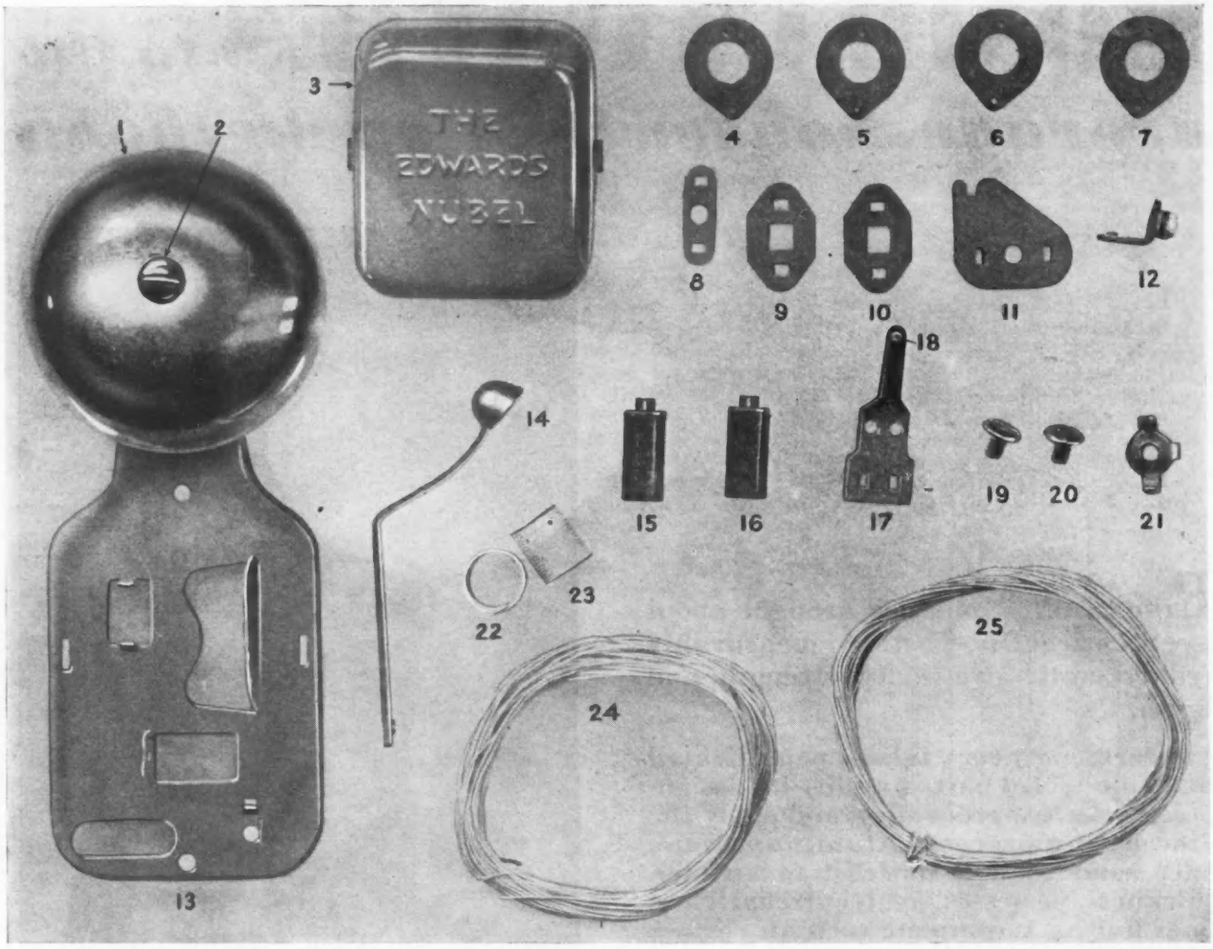
**THE STEWART DIE CASTING CORPORATION**

**4500 Fullerton Avenue, Chicago, Illinois**

**Detroit :: Pittsburgh :: Dayton :: St. Louis**

**Newark :: Cleveland**

# Electric Doorbell Components




ELECTRICAL MANUFACTURING *acknowledges the assistance of Edwards & Company,* 140*th and Exterior Sts., New York City, in the preparation of the illustration shown above and the following table of electric doorbell components. This is typical of many of the different types of these devices manufactured today and will serve to show the various kinds of different materials used*

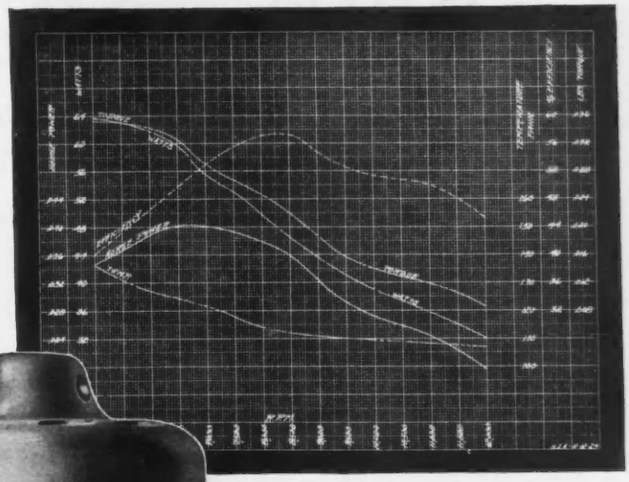
In the electrical industry there are some thirty-five individual manufacturers of doorbells and buzzers such as that illustrated, and in their production there are consumed eight different kinds of raw materials, and these in vast quantities, because of the great number of these devices produced every year.

*Table of Parts and Raw Materials Used in Electric Doorbell Construction*

| Part No. | Description | Material |
|---|---|---|
| 1 | Bell | Steel |
| 2 | Rivet | Steel |
| 3 | Case | Steel |
| 4 | Coil insulator | Fibre |
| 5 | Coil insulator | Fibre |
| 6 | Coil insulator | Fibre |
| 7 | Coil insulator | Fibre |
| 8 | Insulating plate | Fibre |
| 9 | Insulating plate | Fibre |
| 10 | Insulating plate | Fibre |
| 11 | Insulating plate | Fibre |
| 12 | Contact | Brass |
| 13 | Base | Steel |
| 14 | Clapper | Steel |
| 15 | Magnet core | Iron |
| 16 | Magnet core | Iron |
| 17 | Contact | Copper |
| 18 | Contact point | Nickel |
| 19 | Screw | Brass |
| 20 | Screw | Brass |
| 21 | Contact | Brass |
| 22 | Insulating paper | Paper |
| 23 | Insulating paper | Paper |
| 24 | Magnetic wire | Copper & fabric |
| 25 | Magnet wire | Copper & fabric |

# The New DUMORE model "E"

## a motor of exceptional efficiency



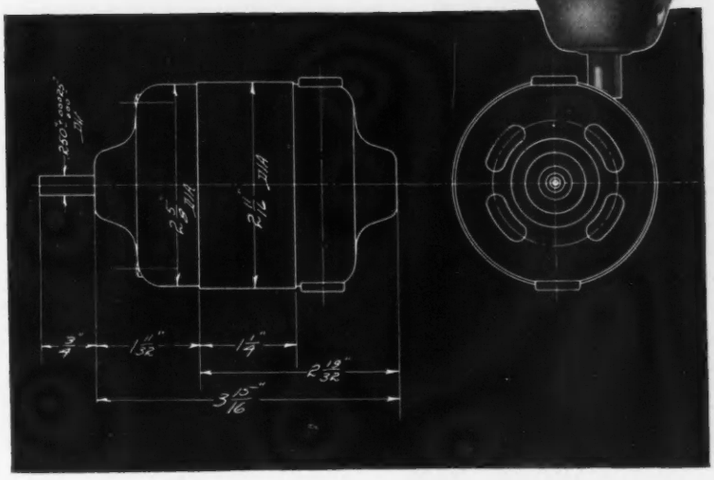
SMALL, compact and of exceptional efficiency, the model "E" Dumore Motor is typical of the quality which has always characterized Dumore Fractional Horsepower Motors.

Study the efficiency and dimension charts reproduced herewith. They tell the complete story of the model "E" and of what may be expected of its performance. The model "E" develops one-fortieth horsepower at 6500 R. P. M. Because of its inbuilt fan, the model "E" maintains a uniform temperature slightly above its point of greatest efficiency. The current consumption is low.

**DUMORE MOTORS**

*are used in*

Floor Polishers . . Vacuum Cleaners . . Drink Mixers . . Electric Grinders . . Hair Driers . . Air Compressors . . Oil Burners . . Bilge Pumps . . Picture Projectors . . Dental Engines . . Routing Machines . . Electric Drills . . Electric Tools . . Jewelers' Tools *and scores of other appliances.*



Like all Dumore Motors, the model "E", because of its high quality construction, uniform dependability, and freedom from destructive vibration, is ideally suited to meet the requirements usually demanded of a motor of this size, type and capacity . . . Consult the list above. It shows only a few of the highly successful applications now being supplied by Dumore. Complete engineering data regarding Dumore Motors will be furnished by any Dumore representative or by writing the company.

THE DUMORE COMPANY
35 SIXTEENTH STREET RACINE, WISCONSIN

TRADE MARK
DUMORE
REG. U. S. PAT. OFFICE

FRACTIONAL HORSE POWER MOTORS
ARE DYNAMICALLY BALANCED!

# A Circuit Breaker Designed for Entry and Branch Circuits

*An outline of the requirements and features of design in a new type of circuit breaker intended primarily for commercial and residence applications**

By H. G. NICHOLS
*Westinghouse Electric & Mfg. Co.*

FROM the earliest days of the electrical industry it was realized that some form of safety valve had to be provided for the protection of circuits and equipment against excess currents. Placing in the circuit a weak link in the form of low temperature fusible metal, or a short piece of metal of a smaller cross sectional area, was obviously the least expensive form of circuit opening device obtainable.

As the applications for electricity grew, the necessity for devices which would withstand temporary overloads, and which could reclose the circuit without replacement of parts, became apparent. The development of such devices naturally took the form of equipment rather than circuit protection, since circuits are usually protected on the basis of maximum capacity, and equipment as closely to actual capacity as possible but allowing at all overloads the greatest time lag the equipment would safely stand. It was also necessary to develop resettable devices to enable the operator to get the equipment back on the line with as little loss of time as possible.

The development of equipment overload protection has far outrun that of circuit protection, except in the higher capacities. The principal reason for this has been that cost is not so great a factor and attention was naturally focused on equipment.

Fuses, which have been almost universally used for low capacity circuit protection, have been developed solely with a view to reduction of fire and accident hazard. Any fusible metal device inherently has the defects of: (a) Necessity for replacement on burn-out; (b) Ease of replacing with higher capacity element; (c) Ease of rendering inoperable by tampering; (d) Low inverse time element for slight or short overloads.

The circuit breaker offers the logical solution to these objections and, by its construction, automatically adds to circuit protection the functions of a switch.

The necessity for low first cost combined with high rupturing capacity has retarded circuit protection development. The experience gained in equipment protection, however, has been valuable. There have appeared in the last few years many forms of inexpensive circuit breakers of low capacity, but none of the American types have advanced beyond the model stage until recently. A number of European designs are produced commercially, but they have not been suitable in their physical form or electrical characteristics for American methods or standards of wiring.

Let us consider the characteristics which a circuit opening device should have bearing in mind that, in the majority of cases, it will receive no supervision or maintenance after it is installed. It should also be borne in mind that we are discussing devices which are to be used at entrances, as well as in main and branch circuits.

The calibration should be fixed and non-accessible. The proper capacity for circuit protection is readily predetermined from the wire size; and, in the case of branch lighting circuits, is limited by the National Electrical Code. There can be no object in changing the calibration except to overload the circuit, and the ability easily to do this destroys the protection.

*A type WK-50 Meter service breaker without meter attached, showing arrangement on cover for operation of the switch lever*

The device should trip free of the handle. This is essential to prevent blocking of handle and the possibility of closing the breaker against an existing short or ground.

The mechanism should be quick-make and quick-break, so designed that the contact pressure is independent of the handle; i.e., it does not vary until the circuit is broken. If these features are not built-in, it would be possible to draw an arc which would destroy the contacts or, at the very least, offer a high resistance, which would in turn cause excessive heating of the contact.

It should have sufficient rupturing capacity to repeatedly open currents of short circuit value. This capacity has been set by the Underwriter's Laboratories at 5000 amperes d. c. The adoption by many public utilities has increased the importance of this feature.

*Presented as a paper at the Meeting of the Western Section, International Association of Electrical Inspectors, in Detroit.

# EDUCATION

**Written by SOCRATES—470-399 B. C.**

**Whom, then, do I call educated? First, those who manage well the circumstances which they encounter day by day and who possess a judgment which is accurate in meeting occasions as they arise and rarely misses the expedient course of action; next, those who are decent and honorable in their intercourse with all men, bearing easily and good-naturedly what is unpleasant or offensive in others, and being themselves as agreeable and reasonable to their associates as it is humanly possible to be; furthermore, those who hold their pleasures always under control and are not unduly overcome by their misfortunes, bearing up under them bravely and in a manner worthy of our common nature; finally, the most important of all, those who are not spoiled by their successes and who do not desert their true selves, but hold their ground steadfastly as wise and soberminded men, rejoicing no more in the good things which have come to them through chance than in those which through their own nature and intelligence are theirs since birth. Those who have a character which is in accord, not with one of these things, but with all of them—these I maintain are educated and whole men, possessed of all the virtues of a man.**

THE OHIO ELECTRIC & CONTROLLER COMPANY
5905 Maurice Avenue
Cleveland, Ohio

# OHIO MOTORS

OHIO reliable MOTORS

The dion principle is simple and inexpensive, consisting of a series of steel plates mounted in a plane at 90 deg. with the path of the arc, insulated from each other and the contacts. The arc is driven between the plates either by magnetic means or by the natural flow of the gases, the latter means being sufficient for low voltages. The gases are deionized, by their passages over the cool surfaces of the plates, and an arc voltage is quickly built up and the arc quietly extinguished.

The overload trip may be a series coil only; a thermal element only, either separately or self heated; or a combination of thermal element and coil, shunt or series.

The series magnetic trip coil has scarcely any inverse time element, nor does it provide a weak link in case of failure.

A SEPARATELY heated thermal element may be used on a breaker which is not required to handle extremely heavy overloads. If used in conjunction with a series trip coil it may be made to function on heavy overload, but this adds to the number of parts, complicating the mechanism with a resulting loss of reliability and increase of cost.

A thermal element and shunt coil may be used with the thermal element in series with the load and the coil across the line. The thermal element deflects on overload closing a contact which energizes the shunt coil tripping the breaker.

The disadvantages of this method are, that the use of a shunt coil adds an unnecessary number of parts, and does not make the device universally applicable within its rating. It is evident that the thermal element might just as well operate the trip direct.

A thermal element and coil may be arranged so that the coil is in series with the load, the thermal element being shunted around it. The current normally takes a path through the thermal element, on account of the coils resistance and reactance, but when it becomes excessive the thermal element deflects, opening its contact, when all the current flows through the coil causing the breaker to trip.

We have here an actual circuit breaker, designed for entrance or branch circuit work, which will visualize the points just discussed and at the same time illustrate many other features which are desirable in such a device.

The housing, for use as a house or apartment service device, conforms to the type in general use, except that front operation of the handle permits closer banking and recessing in the wall if desired.

THE base is easily removable from the box, is entirely self-contained, and does not have to cooperate with any moving parts secured in the box independently, as in the case of the ordinary switch.

The circuit breaker proper is mounted on the base and is made inaccessible by a cover which is sealed at the factory to prevent tampering with the trip mechanism, to keep out dirt, and to prevent damage when the installation is made.

External connections are provided on the circuit breaker so that it is unnecessary to obtain access to, or disturb, the circuit breaker proper.

*Circuit Breaker*—The breaker is small, compact and not limited in its application except by the current and voltage.

It performs equally well on a. c. and d. c. and is independent of frequency.

It may be operated as a switch manually and has a quick-make and break action which will eliminate trouble from improper opening or closing.

The manual operation does not affect or wear the parts used to trip it automatically.

The handle indicates the on, off and tripped positions, and this same handle is used to reset the breaker, when tripped, by moving to the off position.

The operation of the breaker on short circuit is excellent and with absence of noise or flame to cause alarm to an inexperienced operator.

The breaker trips free of the handle and its time of opening and performance is independent of the position of the handle.

The performance is identical whether the breaker merely opens a short circuit or is closed on one.

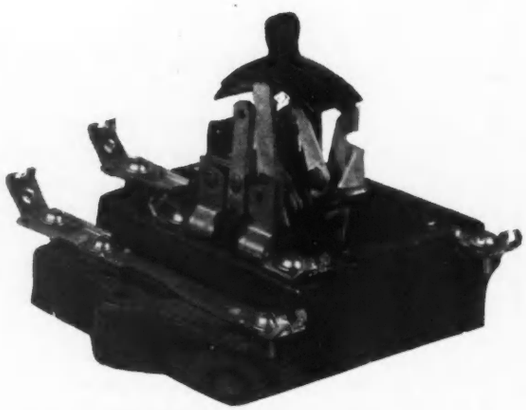
All steel parts are cadmium plated to reduce corrosion.

Bearing and shoulder pins are of non-corrosive material, so that no moving parts can corrode together.

Springs are protected from moisture by wood oil varnish.

Insulation is of such material as not to change its size or quality in the presence of moisture or temperature to which it may be subjected.

*Contacts*—The pressure of the contact is independent of the position of the handle when the circuit is closed. Contact pressure is secured by a toggle which is unvarying



*A meter service breaker with the cover removed showing the construction of the operating mechanism of the device*

regardless of the position of the actuating means when the circuit is closed.

Butt contacts universally used for interrupting heavy currents are provided.

Arcing tips are unnecessary as the contacts are of special material and easily take the arc without injury or loss of any of their ability to carry current. They will not braze together even on the most severe short circuit.

*Tripping Mechanism*—The tripping mechanism consists of a hardened steel latch which is not used during manual operation but only when the breaker opens from overload. The arrangement of the mechanism is such that when the device trips on overload the contacts are opened independently of the breaking of the toggle. This creates an arc voltage immediately and limits the current while the toggle is breaking to further assist in rupturing the current.

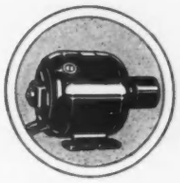
The latch is operated by a self heating, high resistance, heavy cross section bi-metal, without coils or other assisting means. It is calibrated for 75 deg. Fahr. ambient temperature and sealed against adjustment in the field.

The bi-metal operates at a temperature over 250 deg. Fahr. which renders it comparatively free from harmful effects due to change in ambient temperature.

The self heating bi-metal has an inverse time element on overload which becomes rapid on short circuits.

The bi-metal cross section and its mass is such that it will not fuse out on any current that can be obtained with 125 volts before the circuit is opened. The total time for rupturing an actual current of 5000 amperes d. c. 125 volts is 0.0009 second.

The bi-metal is of "U" shape with barriers between the



# A quaint old-fashioned idea

HERE at Robbins & Myers we have always contended that an "ounce" of forethought in the building of a motor is worth a "pound" of servicing later on. That is why we design our own special tools to build into each new job the peculiar differences it requires. That is why we dynamically balance our high speed armatures to a nicety far beyond ordinary standards of precision. That is why we wind motors in hundreds of unique and intricate ways and change the insulation to meet the climatic conditions of all countries. There are many such special things that are never quoted in an R&M estimate or figured in an R&M invoice—things that explain why R&M units are said to run forever on an occasional drop of oil. This old-fashioned thoroughness frequently means less immediate profit, but in the long run it pays good dividends because contented customers keep coming back year after year for "more of the same."

*If you have a problem in electrical-motored machinery, come to Robbins & Myers. We offer you the facilities of a completely modern plant, and the experience of 32 years' precision manufacture in designing, building and applying electric motors, generators, fans, and electrical appliances*

***Partial List of Apparatus to which Robbins & Myers Motors have been successfully applied***

Adding Machines
Advertising Displays
Air Compressors
Baker's Machinery
Blowers
Brick Machinery
Car Heaters
Churns
Cloth Cutters
Coffee Mills
Coin Counters
Confectioner's Machinery
Conveyors
Dental Lathes
Dish Washers
Driers
Elevators
Floor Surfacers
Folding Machines
Heaters
Heat Regulators
Hoists
Humidifiers
Ironing Machines
Labeling Machines
Oil Burners
Office Appliances
Organ Blowers
Mailing Machines
Machine Tools
Meat Choppers
Milking Machines
Movie Projectors
Phonographs
Portable Tools
Printing Presses
Pumps
Radio Stations and Receiving Sets
Spray Equipment
Ticket Selling Machines
Vacuum Cleaners
Ventilating Fans
Unit Heaters
Washing Machines
Wrapping Machines

## Robbins & Myers, Inc.

**Springfield, Ohio** **Brantford, Ontario**

1878

1930

MOTORS, FANS, HAND AND ELECTRIC HOISTS AND CRANES

legs so that in case of mechanical failure of the breaker it will act as a link fuse under short circuit and open the circuit without injury to any other parts. It can be easily replaced.

The bi-metal has such a stiffness that it exerts a pull, if restrained, of 5 pounds on 30 ampere breakers and 3 pounds on 15 ampere breakers.

Owing to the absence of inductive coils, the breaker is as free from lightning effects as fuses and should therefore be in position to always protect the circuit. The fusing of the bi-metal by lightning would release the breaker.

Tests made on rubber covered wire of the same rating as the breaker indicate that the breaker protects the wire perfectly at all overloads, and in no case does the wire show a rise in temperature of over 25 deg. C.

The rubber covered wire carrying its rated current shows a temperature rise of 15 deg. C. in the open. These temperatures are so low that rubber covered wire cannot in any way be damaged.

The commercial application has also been extended to panelboards as well as service switches, the circuit breaker unit being identical.

From a practical viewpoint what does all this mean? The restoring of a circuit, which has been opened due to overload, can now be safely and readily done by the consumer; all thought of danger from shock is eliminated. There is no need to hunt around for a spare, nor to exercise inventive ingenuity in bridging contacts. Trouble calls to the public utility or electrician, with their attendant expense, will materially decrease because the consumer can reset and get back on the line without assistance. Temporary overloads will not interrupt service because the built in time element will take care of them.

The inspection department will know that the installation cannot be abused, and if more capacity is needed it will be properly wired.

The public utility will save the expense of many trouble calls, and gain in revenue because outages will be restored at once.

The customer will save the expense of fuses or of an electrician to restore the circuit, as well as a possible delay.

The industry, as a whole, benefits because the use of electricity is made more convenient and attractive.

The commercial development of small, inexpensive circuit breakers brings food for thought in other directions. Fixed calibration of the circuit being assured, the possibility presents itself of modifying existing restrictions on wiring, particularly lighting and convenience outlet circuits.

Purely for manufacturing standardization, fuse sizes were arbitrarily fixed at 0-30, 31-60, 61-100, etc. These ratings bear no relation to wire capacities. It is now possible to have protection absolutely conform to circuit capacity. As the art develops, breakers may be designed whose time element curve is identical with the safe limits of the circuit they control.

The attention of the entire electrical industry is focused on increasing the use of current in the home, and this increased use can only come by improving and simplifying wiring methods so that the cost of wiring will bear a proper relation to the cost of the appliances it serves.

Any device which, at a very small cost, reduces the maintenance expense, removes the need for the abuse of fuses to restore the circuit at once, and saves the consumer time, trouble and exasperation, cannot help but find its place in the electrical field to the advantage of the public utility, the reduction of the fire hazard, and the advantage of the consumer.

# When Should One Buy New Plant Equipment?

(*Continued from page* 44)

with a profit. If things stop rotating before the complete tunover cycle is completed it avails little if certain steps were performed seemingly cheaply but really at a considerable capital expense.

So it takes a good measure of discrimination in the working of this equipment-buying policy of ours, but what policy worthy the name does not?

There are some equipment purchases made because of the adoption of a new line of product which are justified even though it is not certain that that new line is going to be permanent. Such, for instance, would be the conveyor equipment incidental to the putting of an item into straight line production. The point is that this equipment with minor changes is adaptable even if the given product is discontinued and another similar one taken on.

And incidentally we consider such a purchase as permissible even if it takes longer than two years in which to pay for itself.

All along I have spoken of "proving in" an expenditure. These words should be written in capital letters, for estimated savings with us are no hasty scratch paper calculations. They involve a very careful study of the situation and an assurance that the figures are correct. We are quite willing to spend money to save money, but before we do so we use the best judgment we possess.

I don't wish to give the impression that we lean over backwards for the sake of hewing to the line of any, hard and fast policy. Minor equipment purchases are not subjected to Cost Reduction Department scrutiny. In such cases the foreman or department heads make the recommendation and if the saving is obvious, we put it through without more ado. A thorough investigation such as made for the larger purchases would manifestly be wasted effort. Common sense would dictate that conclusion.

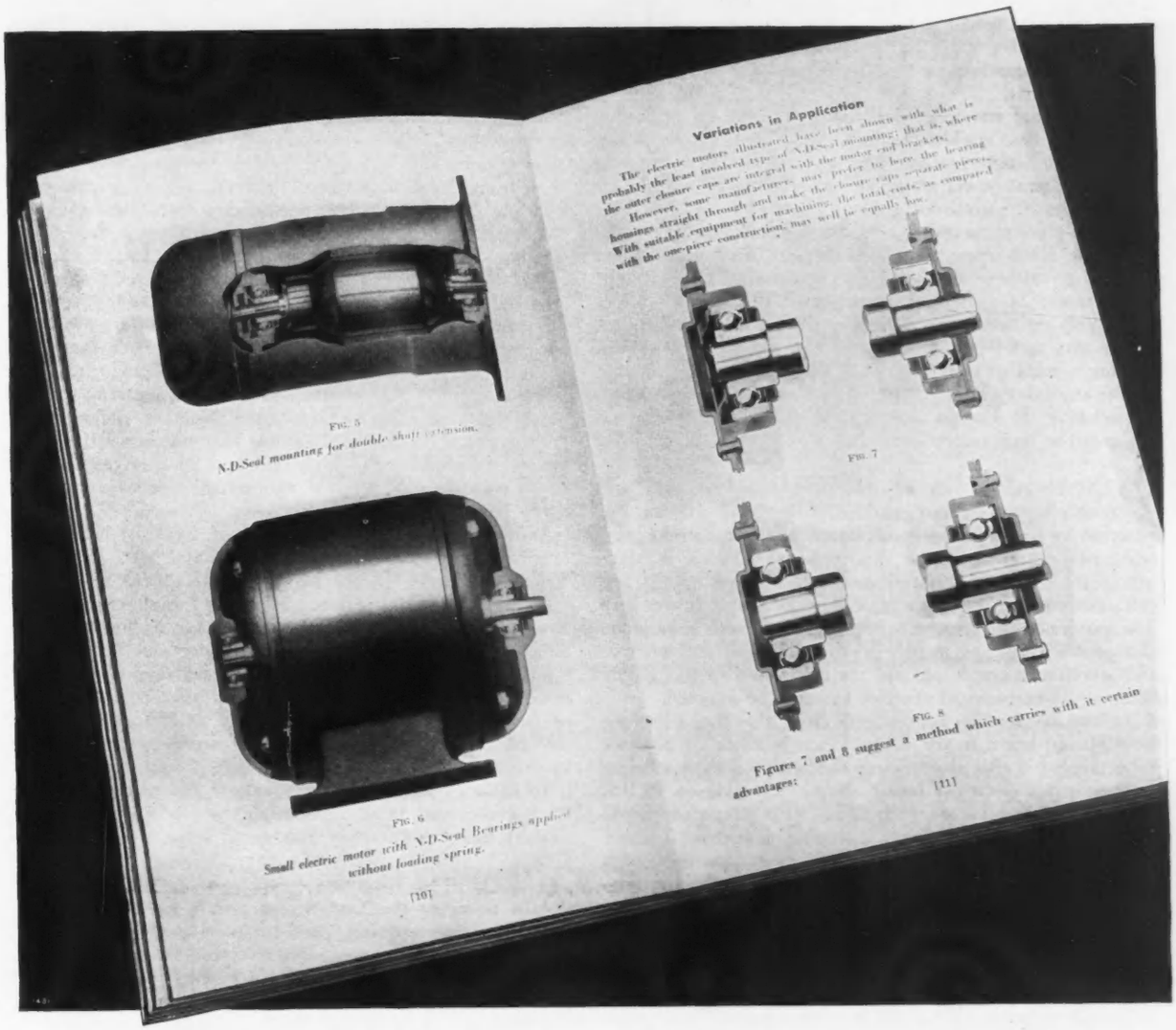
It may fairly be asked how we go about it to keep in touch with the newest in equipment. Of course, the live equipment manufacturer loses no opportunity to tell us. But beyond that we visit other plants freely, and it is not at all necessary that these other plants be in our own line of business.

Contrary to what most people believe, the good lively competitor is not averse to letting you visit his plant and discuss problems with you. At least that has been our experience. Try it out and you too will probably find that your competitor's horns simply do not exist.

As almost a part of the same idea is the reading of business papers in the trade and general management magazines. When any of us on the executive force comes across something in these publications which seems to have possible application to our problems we clip it and send it to our Cost Reduction Department for them to investigate. Out of this procedure has come many an equipment opportunity to cut costs.

It is always possible to get too much of any good thing. This is so with special equipment for the reasons set forth in this article. But so important is it to know every piece of new machinery as it becomes available that we endeavor ever to keep on our toes in this respect. Then, knowing of this, we buy every bit we can justify on a sane dollars and cents basis. While we appreciate that others may arrive at this much desired "sane basis" in some other way, we for our part find the buying policy which we have worked out, and which I have described here, to be admirably suited to our needs.

# NEW DEPARTURE BALL BEARINGS



Variations in Application

The electric motors illustrated have been shown with what is probably the least involved type of N-D-Seal mounting; that is, where the outer closure caps are integral with the motor end-brackets.

However, some manufacturers may prefer to bore the bearing housings straight through and make the closure caps separate pieces. With suitable equipment for machining, the total costs, as compared with the one-piece construction, may well be equally low.

FIG. 5
N-D-Seal mounting for double shaft extension.

FIG. 6
Small electric motor with N-D-Seal Bearings applied without loading spring.

FIG. 7

FIG. 8

Figures 7 and 8 suggest a method which carries with it certain advantages:

[10] [11]

**CUTTING YOUR COSTS IN 1930. The N-D-Seal Ball Bearing was designed to relieve the manufacturers of electric motors, small pumps, portable electric or air-driven tools of the necessity for making closure caps or seals for anti-friction bearings.**

**Keen-minded engineers are finding hundreds of uses for this self-sealed, self-lubricated, unit bearing. Its advantages as outlined in Booklet N may suggest a way for cutting your 1930 assembly and operating costs. May we send a copy to you?**

**The New Departure Manufacturing Co., Bristol, Conn.; Detroit, Chicago, San Francisco.**

# NOTHING ROLLS LIKE A BALL

# Electric Railway Motor Repairs

(*Continued from page 39*)

power nor power plant equipment to handle full service. Since that time locomotives, multiple unit cars, power plant equipment and track electrification have been augmented until now operation in the electrified zone is practically entirely electric.

All branches and main line routes referred to as having been electrified at 11,000 volts, 25 cycles, single phase, constitute a single system energized by the New Haven's Cos Cob, Conn., power plant, supplemented by several different sources of purchased power.

Under present operating conditions the New Haven now has some 576.8 track miles of electrified lines upon which there are running 68 passenger locomotives; 48 freight locomotives; 24 switching locomotives; 10 heating trailers for supplying steam for passenger trains; 63 multiple unit motor cars, and 98 trailer cars for the multiple unit trains, making a total of 341 electrically operated units. On one of the subsidiary lines of the New Haven, the New York, Westchester & Boston Railway, there are an additional 95 multiple unit motor cars and one electric locomotive.

PRACTICALLY all of the electric locomotives and multiple unit motor cars of the New Haven are powered by single phase, commutator, series motors of various types, designed by the Westinghouse Electric & Manufacturing Co. The different methods of drive are gearless quill, geared quill, geared axle, and in one instance, side rod. The motors on the greater part of the equipment have interchangeable armatures which greatly simplifies maintenance and storehouse operation and materials and is thought to be about as economical practice as could be adopted.

As can be readily appreciated from the foregoing the New Haven has a motor maintenance problem of no little importance and this is all being handled in a most efficient manner in its electrical repair shops. In addition to this work these shops also recondition other electrical apparatus used by the company, including industrial motors, control apparatus and lighting equipment, but not such other electrical devices as are employed in signaling, telephone or telegraphic work.

The Van Nest shops, in which this work is done, is a building some 150 feet in width by about 1000 feet in length, of which the greater part is used for work other than that of repairing motors, although this department of the shop occupies some 25,000 square feet of floor space. In addition there are separate buildings in which are a large dipping vat and three electrically heated and thermostatically controlled baking ovens.

As may be seen from the various illustrations on pages 34 to 39, the shops are well equipped with modern facilities for repair work. There are banding machines, coil winding machines, commutator slotting equipment, heavy duty presses and practically every type of machine tool needed, although most of the latter is located in the adjacent machine shop section of the plant. Overhead traveling cranes of from 20 to 60 tons capacity are available over the full range of floor and machines and in addition industrial trucks are used extensively.

The motors reconditioned in this shop range in size from those of fractional horsepower, industrial types to as high as 680 horsepower, and it should be understood that what are termed the main motors, or those used on the passenger locomotives and most of the multiple unit motor cars, are built for operation on both alternating current and direct current which complicates the repair work considerably.

In the motor repair shop the work is largely divided into separate sections or divisions. In other words, one section handles the armatures alone, another coils in the frames, still another looks after repairs to the frames proper. One section handles all armature and axle shaft bearings. Coils for the smaller motors are made in one section. The coils for the main motors are purchased directly from the motor manufacturer. One section of the shop is termed the assembly floor and it is here that all motors are assembled, usually in specially designed fixtures.

Running along one side of the shop is the test rack for the smaller motors that are used principally for driving the auxiliary apparatus. In connection with this is a converter and the necessary control panels for the test racks. All main motors are tested for "shorts" and "grounds" only and receive their final running tests after they have been replaced under the locomotives or multiple unit cars.

Materials for the various jobs are withdrawn from the stock room upon requisitions issued by the department foreman. Each job has a Shop Order Number and all labor and materials are charged against that number rather than against any one locomotive or car. In this manner accurate records are kept of the actual cost of repairs to every unit passing through the shop.

While most of the motors are of modern design, the original gearless type main motors have been in service for almost twenty-three years with, of course, the necessary maintenance attention. Many of the electric locomotives and multiple unit cars operate over as much as 170 miles of track daily and the first forty-one locomotives purchased by the New Haven have each now traveled approximately a million and a half miles. The latest types of passenger engines make as many as 250 miles in one day and it is not at all unusual for an electric locomotive to run from 400 to 500 miles in twenty-four hours. This is to show to what extent the motors are used, and while the speed is not at all times high the loads are often extremely heavy with many starts and stops.

BECAUSE of government requirements, and because of the policy of the New Haven always to keep its equipment in good condition, each locomotive is given a most thorough inspection after each 2500 to 3000 miles traveled, while the multiple unit cars are inspected at the end of 2000 to 2500 miles, thus insuring that any defects will be located before they can cause any trouble or delay in service.

The motor repair shop force consists of about 100 workmen under the direct supervision of a general foreman with assistant foremen in each of the different sections of the repair shop. One point of particular interest is that none of the workmen are permitted to make any tests or inspections of their work. This is all under the jurisdiction of the inspection department and is in no manner connected with the mechanical forces doing the work. In this manner every workman's job is carefully checked for correctness and his ability as a workman is recorded.

As an average from 150 to 160 main motors pass through Van Nest shops monthly, as well as a number of smaller auxiliary and industrial motors up to approximately a hundred of them a month. All motors are delivered to the motor repair shop from the locomotive or car erecting floors and the motor repairmen have nothing to do with either removing the motors from their mountings on the locomotives or replacing them after repairs have been made.

For further information relating to motor repair work in the Van Nest shops of the New Haven, reference may be had to the various illustrations accompanying this article.

## Uniformly combines Structural Strength and low Moisture Absorption for MERCOID CORPORATION*

You, like Mercoid, will find Synthane laminated Bakelite exceptionally good as a structural insulator, because Synthane uniformly combines structural strength with other qualities, such as low moisture absorption, high dielectric strength, good machinability etc.

Of the six standard grades of Synthane, grade C is especially made for structural strength, being a highly resilient insulator. Use it where tensile and transverse strength is required in connection with good insulating properties. Synthane, grade C is made with a canvas base, finished in Natural or Black.

If a standard grade of Synthane does not exactly fit your specifications, we will make a grade that will, at no increase in price. Once established to your specifications, every subsequent shipment of Synthane will be uniformly the same. » » » » It will pay you to test Synthane, to find out for yourself that you can do more with Synthane than you ever thought possible. Send for samples and prove it.

*MERCOID
Automatic Electrical Controls

are recognized by manufacturers of heating and refrigerating equipment as absolutely dependable. To insure this dependability Mercoid uses Synthane laminated Bakelite for the panels of their various controls, because of its uniform structural strength, low moisture absorption, and freedom from distortion. There must be no warping or loss in electrical properties due to variations in temperature or humidity.

SYNTHANE
CORPORATION OAKS · PENNA

NEW YORK, CHICAGO, CLEVELAND, SAN FRANCISCO

Sheets, Rods, Tubes, Fabricated Parts

## R. M. A. Commitee at Work on Annual Show

Plans for the annual convention and trade show of the Radio Manufacturers Association, to be held in Atlantic City during the week of June 2, are well under way, according to a report by the R. M. A. show committee. More than 30,000 persons connected with radio manufacturing and merchandising attended the event last year in Chicago, and an attempt will be made this year to break that attendance record.

This is the first time that the R. M. A. trade show has been held in the East. The convention sessions, exhibitions and annual banquet will be held in the great Atlantic City Auditorium. Show arrangements are in the hands of Jess B. Hawley, chairman of the trade committee. G. Clayton Irwin, Jr., is again director of the annual event.

## Eveready Raytheon Expansion Planned During 1930

Additions to the mechanical facilities of the Eveready Raytheon tube factory at Newton, Mass., increased personnel for the plant, and one of the largest advertising appropriations ever devoted to a single product of its line are included in the 1930 plans of National Carbon Company for its Eveready Raytheon tube division, according to an announcement made recently by Harry S. Schott, general sales manager of National Carbon Company.

The sales records set by Eveready Raytheon tubes in 1929, resulting from the wide demand for the four pillar tube construction, plus the demonstrated increase in consumer demand for radio tubes with the expansion of the industry have resulted in the extensive expansion program, it was announced.

## Howell Electric Motors Buy Jeannin Electric Co.

The Howell Electric Motors Company has purchased the business of the Jeannin Electric Company of Toledo, Ohio, manufacturer of a line of single-phase and direct-current motors from 1/30 hp. to 10 hp. in size.

The manufacturing equipment and business of the Jeannin Electric Company will be moved to the Howell plant gradually, so as not to interrupt service to present Jeannin customers, and added to the line of apparatus already being produced by the Howell Electric Motors Company.

The purchase was made for cash and without change in the corporate structure of the Howell Electric Motors Company.

This purchase gives Howell a very complete line of practically all types of motors from the smallest to over 100 hp.

## A. L. E. A. Meeting

As this issue of ELECTRICAL MANUFACTURING goes to press, the 1930 convention and fixture market of the Artistic Lighting Equipment Association is in session in Washington, D. C. The meeting, scheduled for Feb. 9-15, will be reported in detail in our March issue.

## Staff Named for Westinghouse Refrigerator Division

The design, manufacture, marketing, and servicing of the new Westinghouse refrigerator, recently placed on the market by the Westinghouse Electric & Manufacturing Company, are under the direction of the following men:

Carl D. Taylor

Carl D. Taylor, general manager, formerly manager of the industrial section of the company's central sales district.

M. C. Terry, manager, engineering department. He is primarily responsible for the present design of the refrigerator, having directed the development work during the past twelve years. Previous to this he was assistant chief research engineer of the South Philadelphia steam apparatus works.

J. F. O'Donnell, sales supervisor, formerly syndicate representative in the domestic appliance department of the New York office.

Ralph Gates, manager, sales promotion department, was formerly editor of the *Westinghouse Magazine.*

John W. Haley, formerly of the headquarters sales department at East Pittsburgh, is special representative in charge of warehousing.

L. K. Baxter, with extensive experience gained from other companies, is manager, service and installation department.

## Crosley Radio Corp. Completes New Eight-Story Factory

With construction of its new eight-story factory unit completed, the Crosley Radio Corporation, Cincinnati, boasts of one of the largest and most modern manufacturing plants in the radio industry. The new facilities provide 222,000 additional square feet of floor space. Six floors are utilized for the manufacture of receiving sets. The general offices and engineering department are located on the seventh floor. On the eighth floor workmen are completing construction of the executive offices and the new home of WLW, the Crosley 50,000-watt broadcasting studios.

Across Arlington Street is a new one-story final assembly and shipping building, 600 ft. long. Here as many as twenty-nine freight cars at a time can be handled and loaded. By means of a carousel conveyor running through the shipping building, cabinets can be loaded at the rate of 580 sets per hour. Increased switching facilities are provided by loading tracks, which run to the new building from the Crosley spur of the Baltimore & Ohio Railroad.

## Beasley Companies in Merger with Sanitarium Equipment

Beasley-Eastman Laboratories and Beasley Harris Company, Detroit, have been merged with the Sanitarium Equipment Company, Battle Creek, Mich. Mr. Beasley is now president in charge of the merged companies.

Sanitarium Equipment Company has manufactured physical therapy equipment for nearly 40 years and Beasley Harris Company has manufactured apparatus which was not made by the other two companies.

## Varley Publishes 3rd Edition of "The Electro Magnet"

Into the 175 pages which make up the third edition of *The Electro Magnet,* published by Richard Varley, Englewood, N. J., the authors have crammed an amazing amount of useful information on the direct current electro magnet.

Full size pictures add much to the value of the book and they are accompanied by specifications, performance curves, weights, winding formulas, pounds pull formulas and watts rating.

## Square D Puts Into Effect New Calendar System

Following the lead of other large business organizations, Square D Company, Detroit, put into effect Jan. 1, 1930, the much discussed 13 period year, which will be used in handling all accounts, salaries and internal records of the company.

This new system replaces the former method of calendar months. The 13 periods are made up of four weeks each, or 28 days. These sub-divisions are always constant. One of the important advantages claimed for this system is the easy and

Here is a 2500 K. W. Rotary Converter carrying its heavy load on HOFFMANN Precision Roller Bearings.—And, below, is a 1/10 Watt Tone Alternator running swiftly and continuously on NORMA Precision Ball Bearings.

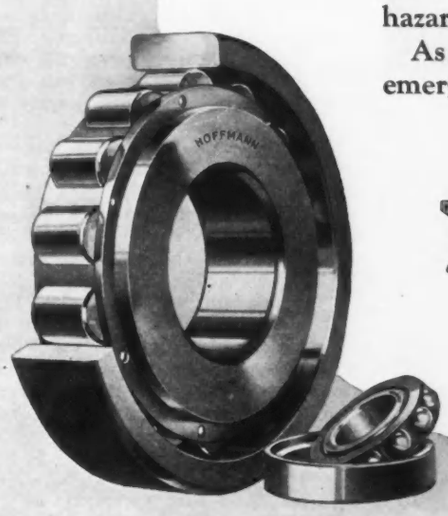
# Giant . . .

EXTREME conditions—whether of load or of speed, or of both combined—present no difficulties which cannot be met with greater assurance by using NORMA-HOFFMANN Precision Ball or Roller Bearings.

From the least to the greatest, over the entire range of NORMA-HOFFMANN sizes and types, there is an in-built reserve of service-ability which stands for security against the hazards of bearing failure.

As against this extra-service-ability—always there when the emergency demands—small price differences are negligible.

*Write for the Catalogs—or, better still, ask our engineers to work with you.*




"NORMA-HOFFMANN"
PRECISION BEARINGS

# or Pigmy!

NORMA-HOFFMANN BEARINGS CORPN.-STAMFORD CONN. U.S.A.

accurate computation of time periods. Work schedules can be established which are exactly the same as to days of the week for each period. At the Square D Company, for example, which operates on a five-day week, the factory payroll will always start on a Sunday, run through Saturday and Sunday.

Under this system of operation the customary method of referring to period dates is as follows: 3 P 27-30, meaning the 27th day of the third period, 1930.

## General Cable Corp. Buys Peerless Wire & Cable

Purchase of the Peerless Insulated Wire & Cable Company, Pennington, N. J., by General Cable Corporation, was announced recently. Peerless products will be continued at Pennington under the personal direction of its former management. The Pennington plant will be operated as a part of the Standard Underground Cable Division of General Cable Corporation. Sales will be continued under the trade name "Peerless."

## Triad Manufacturing Company Licensed by R. C. A.

Negotiations between the Radio Corporation of America and the Triad Mfg. Company of Pawtucket, R. I., makers of Triad Radio Tubes, which have been in progress for some time, have culminated in the licensing of the Triad Mfg. Company to manufacture radio tubes under all patents now controlled by them.

## E. H. Clark Joins Sales Staff of Rockbestos Products

E. H. Clark has joined the selling organization of the Rockbestos Products Corporation. He will be connected with the Chicago district office.

Mr. Clark has been in the electrical field for the past sixteen years as electrical superintendent of the Mayville plant of the Youngstown Sheet & Tube Company; in construction work with the Wisconsin Gas & Electric Company at Kenosha, Wis., and as salesman for the Electric Appliance Company of Chicago.

F. W. Allen, who has been connected with the Chicago sales office of this company, will be in charge of a new district sales office at 2143 Exchange Bldg., St. Louis.

## Larry Hardy Named Sales Head of CeCo Manufacturing Co.

CeCo Manufacturing Company, Providence, R. I., has appointed as sales manager Larry Hardy, who for more than a year has been in charge of the company's Midwest and Northwest sales activities, with headquarters in Chicago. Before joining the CeCo organization Mr. Hardy was connected with the merchandising department of General Electric Company and Landers, Frary & Clark.

## Eastern Tube & Tool Outstanding Stock Is Bought Up

E. J. Schneider, president, treasurer and general manager of the Eastern Tube & Tool Company, Brooklyn, N. Y., and I. G. Trattler, vice-president and sales manager of the company, have bought up all outstanding stock, according to a recent announcement.

## Leland Electric Company Located in New Dayton Factory

The new factory building which was started in December, 1928, by the Leland Electric Company, Dayton, Ohio, has been completed and is now being occupied by both factory and office personnel. All departments, including home administration offices, are housed in the large building, which is of the single-story, saw-tooth type, designed specifically for the production of fractional horsepower motors. The address of the new plant is 1501 Webster Street, Dayton, Ohio.

The Leland company has taken over General Kontrolar Company of Dayton. Kontrolar sign flashers are now manufactured in the new Leland plant.

## Edison Lamp Headquarters Moved to Cleveland

Edison Lamp Works of General Electric Company will be established on or about March 1, in its new and larger quarters at Nela Park, Cleveland, Ohio, which has been the center of the administrative, manufacturing and research departments of the incandescent lamp activities of General Electric for several years. Edison Lamp Works, which is one of the two G.E. lamp sales divisions (the other being National Lamp Works) will benefit from closer contact with these departments than has been possible in its Harrison, N. J., location.

E. E. Potter

R. C. A. Radiatron Company has purchased the Edison Lamp Works' Harrison property.

The following personnel changes have been announced by Edison Lamp Works: E. E. Potter succeds G. C. Osborn as general sales manager; P. D. Parker is assistant sales manager; H. F. Barnes becomes assistant sales manager in charge of advertising and sales promotion.

## New Westinghouse Laboratory Will Cost $1,500,000

An expenditure of $1,500,000 will be made by the Westinghouse Electric & Manufacturing Company in the construction of a central engineering laboratory at E. Pittsburgh, Pa., it was announced recently.

### Nema Convention

News of the mid-winter convention of Nema, held in New York, Jan. 20-24, will be found on pages 52, 53 and 54 of this issue.

# Nema Notes

## Annual Meeting

The next Annual Meeting of Nema will be held at Old Point Comfort, Va., during the month of October. The Vanderbilt-Chamberlain Hotel will be headquarters. The exact date of the meeting will be determined later.

Members will be interested in the change of location from Hot Springs, where the fall meetings have been held in the past. The decision on the location of the meeting was made at the Dec. 20 meeting of the Executive Committee.

## Airport Lighting Section

The manufacturers of airport and flood lighting equipment held a meeting at the Fort Shelby Hotel, Detroit, Mich., Dec. 19, 1929, and unanimously voted to organize a section of Nema.

The interruption of transportation facilities by storm resulted in a smaller attendance than was anticipated, and compelled postponement of the election of officers until the next meeting.

Representatives of the Crouse-Hinds Company, General Electric Company, and Reflector & Illuminating Company were present.

The next meeting of the section was held at the Westinghouse Lighting Institute, New York City, on Tuesday, Jan. 21, during the mid-winter meeting of Nema. Invitations were extended to all manufacturers to attend this meeting in order that they might become familiar with the work.

## Hubert, Publicity Director

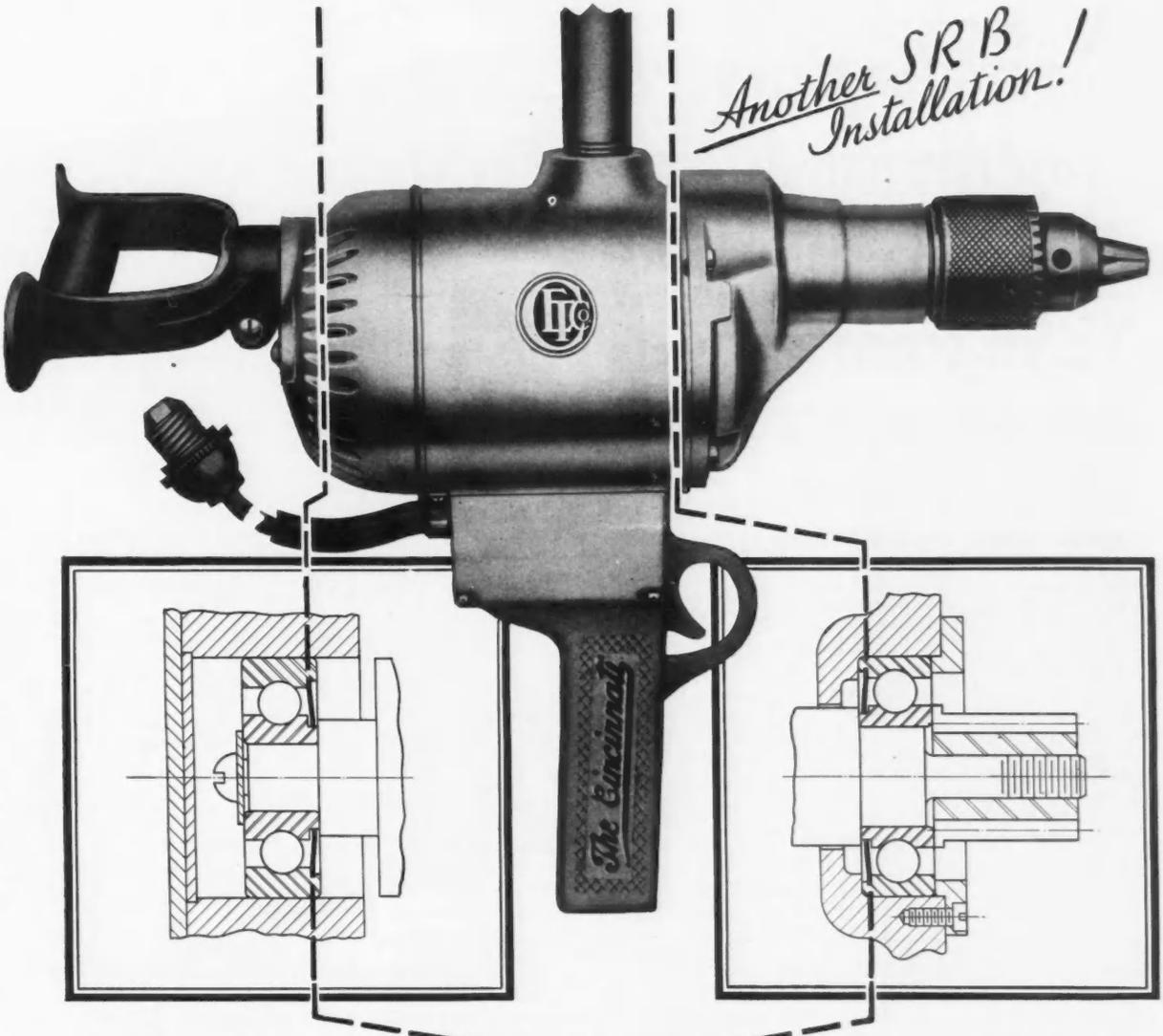
Edward H. Hubert, formerly an assistant secretary of the American Institute of Electrical Engineers, has been appointed director of publicity for the National Electrical Manufacturers Association to succeed Albert Pfaltz, resigned.

At the American Institute of Electrical Engineers, where Mr. Hubert has been located during the last six years, he has been secretary of the Meetings and Papers Committee, and his work has been in connection with the arrangement of convention programs and with publications. He was formerly with the McGraw-Hill Publishing Company, where he served in the editorial department of *Electrical World* and other publications. Mr. Hubert was previously connected with the engineering department of the Georgia Power Company.

## Frigidaire Joins Nema

Agreement on modifications of the National Safety Code and the presence, for the first time, of representatives of the Frigidaire Corporation were the outstanding developments at a meeting of the Refrigeration Division of Nema, held at the Book-Cadillac Hotel, Detroit, on Dec. 9. The Frigidaire Corporation is now a member of the Nema division following subsequent approval of the board of governors of its application.

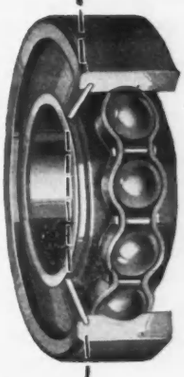
Another important action taken at the meeting was the decision to collect production figures through Nema headquarters




## SRB *Lubri-Seal* BALL BEARINGS *in* *The Cincinnati* ELECTRIC DRILLS

ANOTHER manufacturer of Portable Electric Tools who uses SRB *Lubri-Seal* Ball Bearings for increased efficiency and improved performance!

In this application, the *Lubri-Seal* feature guards against leakage of grease to the windings, at the same time excluding dirt and grit from the bearing housing. Lubrication is required only at rare intervals... maintenance is reduced to an absolute minimum.



Let our engineers show you how to *"Lubri-Seal"* your own product for increased efficiency and improved performance.

STANDARD STEEL AND BEARINGS INCORPORATED
*Plainville* *Connecticut*
DIVISION OF MARLIN-ROCKWELL CORPORATION

# Ball SRB Bearings

and the releasing to the public of totals showing the industries' quarterly production of equipment in each major classification.

## Brevities

**Arcturus Radio Tube Company,** Newark, N. J., has announced plans for the manufacture of a complete line of battery type tubes in addition to its present line of A. C. tubes.

**T. R. Brawley Felt Company,** 279 Twentieth St., Brooklyn, N. Y., is the new name for T. R. Brawley.

**Paragon Die Casting Company** is now located in a new plant at 2701 Crawford Ave., Chicago. Considerable new machinery has been installed and, with increased floor space, a large production rise is scheduled.

**Appleton Electric Company,** Chicago, has named as district manager of the San Francisco office, located at 655 Minna St., Albert W. Rockwell, who has been identified with the company's activities on the Pacific Coast for the past two years.

**Wagner Electric Corporation,** St. Louis, has appointed Major E. R. Elam as branch manager in the Minneapolis territory. Immediately preceding the war, and for a few years after its close, he was power engineer of the Central Illinois Light Company, of Peoria, Ill. In 1927 he joined the Wagner organization as a salesman in the St. Louis territory.

**General Electric Company** announced recently that T. K. Quinn, manager of the electric refrigeration department, has been named to take general charge of the company's refrigerator business, including manufacturing, engineering and sales.

**Recto Manufacturing Company,** manufacturer of molded insulation, has moved into a new factory at Appleton and B. & O. R. R., Cincinnati, Ohio. The new location, equipped with up-to-date machinery, offers about four times as much space as the old site.

**Ohio Electric & Controller Company,** 5900 Maurice Ave., Cleveland, conducted its annual sales conference in Cleveland, Jan. 13 to 17. The meeting was attended by all the company's motor and magnet representatives in the United States.

**Youngstown Sheet & Tube Company** has promoted Edwin P. Corey, assistant general manager of sales, to general manager of the company's sales. He has formerly had charge of pipe and wire products. The position is newly created, the duties having heretofore been discharged by Walter E. Watson, vice-president, who continues in that capacity. L. E. Wallace will succeed Mr. Corey.

**Reliance Electric & Engineering Company,** Cleveland, has established a branch office at 207 Richardson Building, Toledo, to serve northwestern Ohio, northern Indiana and southern Michigan. C. E. Stine, formerly of the Detroit office, has been placed in charge. The company's Pittsburgh office has moved to enlarged quarters at 2300 Koppers Building.

**John F. Fast & Company,** manufacturer of electrical condensers, has moved its office from 3982 Barry Ave., Chicago, to 3123 N. Crawford Ave. The factory still remains at its former location.

**General Electric Company** has moved the Atlantic district sales and service departments from the Witherspoon Building, Philadelphia, which they had occupied for 22 years. The sales and engineering departments now occupy the 17th, 18th and 19th floors of the Mitten Building, Broad and Locust Sts. The service departments are now located in the General Electric Building, 429 N. Seventh St.

**Trav-ler Manufacturing Corporation,** 1818 Washington Ave., St. Louis, announced recently that Robert W. Bennett, formerly vice-president and general sales manager of the A. C. Dayton Company, has joined the Trav-ler organization as vice-president in charge of sales and advertising.

**Premier Vacuum Cleaner Company,** Cleveland, has appointed as assistant sales manager Walter J. McCord, formerly manager of trade relations. In his new capacity Mr. McCord has moved his headquarters from New York to Cleveland.

**Bander Lighting Fixture Company** has moved from 1400 Broadway to 1476 Broadway, New York City.

## Coming Conventions

**American Institute of Electrical Engineers.**—District meeting at Springfield, Mass., May 7-10.

**American Society of Mechanical Engineers.**—Third National Materials Handling Meeting, Hotel Stevens, Chicago, March 5, 6, 7.

**Artistic Lighting Equipment Association.**—1930 convention and fixture market, Washington, D. C., Feb. 9-15, 1930. Business sessions at the Mayflower Hotel; exhibition at the Washington Auditorium.

**Factory and Production Exposition.**—Chicago, March 3-7, 1930.

**National Electric Light Association.**—Annual convention, San Francisco, Cal., week of June 16, 1930.

**National Electrical Manufacturers Association.**—Annual meeting at Old Point Comfort, Va., in October. (Exact date will be announced later.)

**Radio Manufacturers Association.**—Annual convention and exhibition, at Atlantic City, N. J., week of June 2, 1930.

## Financial

### Altorfer Bros.

Net profits of Altorfer Bros. Company, Peoria, Ill., for 1929 were $511,140.67 before deduction of federal income tax and $454,176.96 after deduction, says the annual statement made public by President Altorfer.

Total current assets as of Dec. 31 last are $1,497,940, approximately six and one-half times all liabilities, an increase over a year ago of $239,446. Total assets are $2,648,983, an increase of $328,236, with an increase of $66,861 in plant investment. Surplus account, $525,147, shows an increase of $211,761 after payment of all dividends for 1929.

### Kolster Radio

Kolster Radio Corporation, Newark, N. J., and subsidiaries except Kolster-Brandes, Ltd., report for year ended Sept. 30, 1929, net loss of $916,232 after expenses, depreciation, etc.

Income account for year ended Sept. 30, 1929, follows: Gross income from sales and operations and other income, $13,937,-597; costs, royalties and expenses, $14,461,-308; operating loss, $523,711; depreciation, $392,521; net loss, $916,232.

Three receivers were appointed last month in Newark, N. J., for the Kolster Radio Corporation. They are Harry J. Hendricks, Newark real estate man; Harry Meyers, president of the Lincoln National Bank, Passaic, N. J.; and Ellery W. Stone, president of the Kolster Radio Corporation. A joint bond of $50,000 was ordered by the court.

### A. C. Gilbert

A. C. Gilbert Company, New Haven, Conn., reports for year ended Dec. 31, 1929, net income of $450,457 after charges and federal taxes, equivalent after dividends on $3.50 preference stock, to $3.70 a share on 100,000 no-par shares of common stock. This compares with $346,891 or $2.62 a common share in 1928. Both sales and earnings established new records.

### Cutler-Hammer

Statement of Cutler-Hammer, Inc., Milwaukee, and subsidiaries as of June 30, 1929, shows total assets of $8,040,287 compared with $7,246,846 on Dec. 31, 1928, and surplus $4,381,772 against $3,728,621. Current assets totaled $5,343,027 and current liabilities $762,248 as contrasted with $4,-759,466 and $664,998 respectively on Dec. 31, 1928.

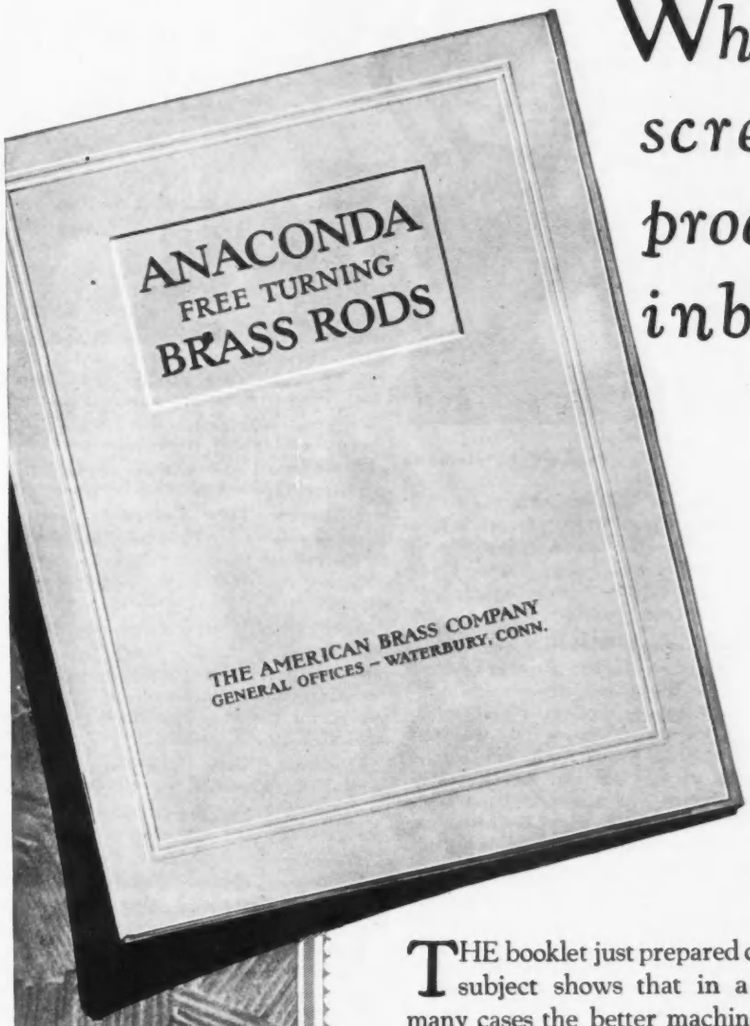
### Zenith Radio

For twelve months ended Oct. 31, 1929, net profit of Zenith Radio Corporation, Chicago, was $337,593 after all charges, including depreciation and federal taxes, equivalent to 84 cents a share on 400,000 no-par shares of stock. No comparison is available. Company's fiscal year ends April 30.

### Perryman Electric

Sales of Perryman Electric Company, North Bergen, N. J., Inc., for 1929 were $1,121,016 compared with $672,338 in 1928, an increase of 67 per cent. The company produced 1,142,939 radio tubes of all kinds

# When are screw machine products cheaper in brass than steel?




THE booklet just prepared on this subject shows that in a great many cases the better machinability and higher scrap value of brass combine to more than offset its added cost. The experience of leading manufacturers forms a basis for the information presented and cases studied, which may enable you to approximate the comparative costs of producing similar pieces in brass and in steel. Write for Publication B-14.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut
Offices and Agencies in the Principal Cities
Canadian Mill: Anaconda American Brass Ltd.
New Toronto, Ontario

ANACONDA
COPPER ANACONDA BRASS

during 1929, or more than two and a half times its output of 437,500 tubes in the preceding year, when higher prices were general in the industry.

### Eisler Electric

Eisler Electric Corporation, Newark, N. J., has declared initial 37½ cent quarterly dividend, placing stock on $1.50 annual basis.

### Air-Way Electric

Air-Way Electric Appliance Corporation, Detroit, for year ended Dec. 31, 1929, should report record earnings, estimated at approximately $1,650,000 after all charges, equal after allowing for dividends on the 7 per cent preferred stock to better than $3.75 a share earned on 400,000 no-par common shares. This compares with net profits of $1,401,643, or $3.15, on the same amount of common stock reported for 1928, the previous record year.

### Kelvinator

Kelvinator Corporation, Detroit, reports for quarter ended Dec. 31, 1929, net loss of $87,000 after depreciation, interest, etc., comparing with net loss of $413,396 in December quarter of 1928. This is first quarter of current fiscal year.

G. W. Mason, president, in commenting on Kelvinator report said: "While the net result from operations for the quarter just ended showed a loss of $87,000, it should be borne in mind that the last quarter of any calendar year has always been the period of lowest volume in this industry and customarily shows a loss."

### Copeland Products

Copeland Products, Inc., Detroit, reports for ten months ended Oct. 31, 1929, which is the end of the new fiscal year, net profit of $209,007, after all charges, equal to $2.05 a share on 101,991 shares of Class A stock. In year ended Dec. 31, 1928, net profit after all charges was $201,695, or $1.98 a share on 101,992 Class A shares then outstanding.

### Crocker-Wheeler

Offering of 58,100 shares of no-par common stock of Crocker-Wheeler Electric Manufacturing Company, Ampere, N. J., at $15 a share in the ratio of one share for each four held, has been made to stockholders of record Feb. 3, with subscription rights expiring Feb. 24, with payment to be made in full on or before that date.

Proceeds will reimburse the company to a substantial extent for funds expended in retiring $863,200 par value 7 per cent preferred stock.

Company states that future prospects indicate a continuance of satisfactory progress which characterized the 1929 operations. The 1929 billings were 54.8 per cent in excess of the 1928 figures and orders booked during the past year showed an increase of 26.8 per cent over 1928 bookings.

Net income for year ended Dec. 31, 1929, amounted to $407,028 after all charges, including depreciation and federal taxes, compared with $84,962 in 1928.

## Obituaries

**Andrew L. Hatfield,** president of Hatfield Rubber Works, Inc., Hillside, N. J., manufacturer of insulated wires, died on the 7th of January. He started his career as an inventor when he was 20 years old by perfecting an automatic switch, still in use on railroads. A short time later he perfected the synchronization of two or more generators, a piece of work which influenced the light system now in existence. He has to his credit approximately 250 patents, which include an electric washing machine, a clothes washer and a safety razor blade sharpening machine which handles 36 blades at a time.

**Andrew L. Hatfield**

**Edwin Bennett Gillinder,** one of the founders of Gillinder Brothers, Port Jervis, N. Y., manufacturer of illuminating glassware, died in Philadelphia, Jan. 1. He was 60 years old. In 1889 he joined Gillinder & Sons, one of the pioneers in illuminating glassware in this country. He was associated with that firm until 1912, when he withdrew to organize a company with his brothers, William T. and James, who survive him.

**John L. Gaumer,** vice-president, Biddle-Gaumer Company, Philadelphia, died at his home in that city, Dec. 21, at the age of 81. Most of his active life was spent in the lighting fixture industry. He launched his own business in 1882 and was joined by Robert Biddle in 1890.

**William Lawall Jacoby,** president of the Kellogg Switchboard & Supply Company, Chicago, died in that city on Jan. 11 after a short illness. Pleurisy was given as the cause of his death.

Mr. Jacoby had been president of the company since March, 1927. For two years he was a member of the board of directors of the Radio Manufacturers Association, during which time he was chairman of the Fair Trades Practice Committee. He was also, for two years, a member of the board of directors of the Electric Association of Chicago. He was born in Bethlehem, Pa., Dec. 12, 1873.

**Ferdinand Baumann,** prominent in the tool industry as an early associate in the manufacture of the Klein line of pliers, climbers, splicing clamps, etc., and active until his untimely death on Dec. 31, 1929, was a native of Germany. In 1872 he left his home and set out for America. He secured a job in Chicago as a blacksmith's helper. The blacksmith was Mathias Klein.

Mr. Baumann was on his way to work in Chicago when he was run down by a street car and killed.

## Manufacturers' Literature

ELECTRICAL MANUFACTURING *presents a digest of recently issued catalogs, bulletins and other advertising material. Manufacturers are invited to send literature for review in this column.*

**Reliance Electric & Engineering Company,** Cleveland. New 24-page illustrated bulletin, No. 205, covering Type T heavy-duty planer motors for reversing service. This bulletin not only describes the motor but also tells what control is required and how it operates. The advantages with direct motor control on planers are freedom from losses due to belt troubles, more power at the tool, greater overload capacities, cutting speeds maintained in uneven cuts, fine graduation of speed with independent adjustments for cuts and return.

**Wolverine Tube Company,** Detroit, has a stock of leaflets describing most of its products. These leaflets may be obtained by writing to Holmes, Inc., Stephenson Building, Detroit.

**Arkell Safety Bag Company,** 10 E. 40th St., New York. A catalog composed of pages showing samples of this company's line of Arkell Super Strength papers for covering machinery, motors, dynamos, etc.

**Sangamo Electric Company,** Springfield, Ill. Parts list No. 11, Type HC watt-hour meters, single-phase and polyphase service and switchboard types.

**Rockbestos Products Corporation,** New Haven, Conn. Bulletin No. 60, completely describing this company's new magnet wire.

**South Bend Lathe Works,** South Bend, Ind. Bulletin No. 77, 20 pages, is devoted exclusively to the descriptions and illustrations of the many attachments used with new model South Bend lathes. The bulletin describes the many applications for lathes in connection with associated devices.

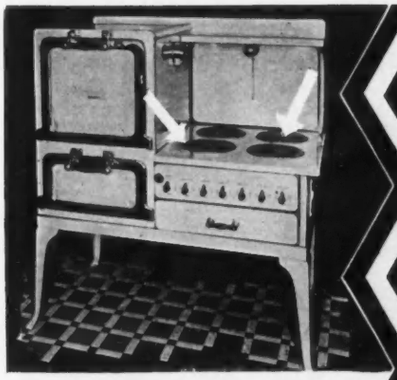
## Information Wanted

We have beeen asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Avenue, New York City.

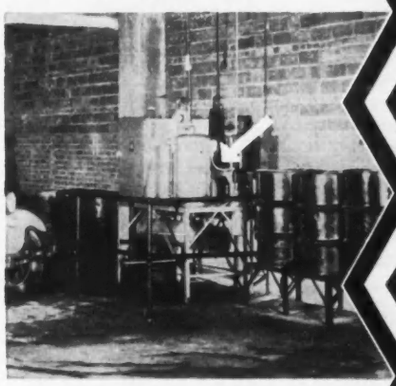
"L. R. Co." Receptacles.
"Williams" Commutator Dressing.
"Flint" Waffle Iron.
"Pioneer" House Pump.
"Defiance" Cigarette Lighter.
"Hillcrest" Line of Lighting Fixtures.
"Thermodyne" Therapeutic Lamp.
"Aspinall" Soldering Fluid.
"Indulet" Fittings.
"Wilson" Box Supports.

"Seco" Plug Fuses, asked for in our January issue, are manufactured by U. S. Electric Co., Trenton, N. J.



Electric ranges are but one of the dozens of appliances being equipped with patented Chromalox units by leading manufacturers which insure long operating life. Here are heating units that withstand the wear and tear of everyday use. More and more the appliance industry is unmistakably turning to the embedded type Chromalox element for the solution of its heating problems.

Melting metal was a difficult heating job until Chromalox heaters were adopted for type-metal melting units. Hundreds of type-setting machines grind out the news of the day on schedule time because their metal melting pots are equipped with dependable, high-temperature Chromalox units. Built to withstand overvoltage and resulting overwattage, they have broken every record for heavy-duty performance.



Engineers designing this oil reclaiming equipment found Chromalox units invaluable in enabling their product to outperform other equipment. Other engineers will tell you the same is true of their products which proves the vital importance of the heating unit. Regardless of the product you are now working on or plan to develop later, Chromalox engineers stand ready to work with you. Benefit by their long experience!

# PROFIT BY WHAT DESIGN ENGINEERS OF 173 COMPANIES WOULD TELL YOU ABOUT HEATING UNITS

How very well they know the vital importance of having the proper heating element built into their products. It's like building an automobile or a fine watch. The motor, the works, the insides, must be right or it won't go.

Those engineers would tell you how these patented Chromalox units are built to last; that they found them to have more inherent strength both structurally and electrically; that they withstand overvoltage and resulting overwattage. What's more, severe usage doesn't affect these patented units.

Lower assembly cost, resulting from calling us in to help with the final design, showing them the right way to build in the heating units, is another point they would emphasize. Chromalox units fit the product itself; give the right heat. In short, keep the product operating as it should—for a long time.

*When writing for Chromalox bulletins, tell us about the products you are developing and want properly heated. There's no obligation!*

## CHROMALOX

**ELECTRIC HEATING UNITS**

Mfg. Exc. by EDWIN L. WIEGAND CO., 7530 Thomas Blvd., Pittsburgh, Pa.

# New Goods for Your Inspection

## Single-phase Capacitor Motors

General Electric Co., Schenectady, N. Y., announces a line of single-phase, squirrel-cage capacitor motors, designated type KC, especially designed for quiet operation. These motors are expected to find their principal application driving blowers and ventilating fans in buildings, on low-torque centrifugal machinery on low-pressure pumping applications, on some wood-working machines and machine tools where the motor is built into the machine, etc.

Although the motor is classified as a single-phase machine, it is really a modified two-phase, squirrel-cage motor with a capacitor in series with one phase of the stator windings. This gives starting char-

acteristics similar to the two-phase, squirrel-cage motor; that is, it is self-starting. The capacitor remains in the circuit throughout starting and running, so that full-voltage hand or magnetic control only is required. As a result of this, single-phase pulsation is absent. In addition special slot combinations and rotor construction are used to obtain an even greater degree of quietness.

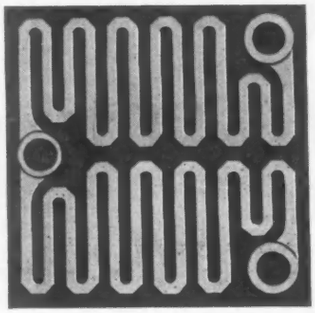
The ratings available in the new line are from 1 to 25 horsepower, inclusive, at 3600, 1800, 1200 and 900 r.p.m. constant speed, with starting torque from 60 to 40 per cent of full load running torque, depending upon speed. Maximum torque is approximately 200 per cent of full load.

## Columbia Cast Grid Tank Rheostats

Columbia Electric Mfg. Co., 1292 E. 55th St., Cleveland, Ohio, is marketing a rheostat for the control of current in plating solutions in which the cast grids are made in standard sections of 800 amperes or smaller, and these in turn are mounted together for sizes of 1000, 1500, 2000 amperes capacity and larger. The cast grids are uniform in cross section, and each grid is tested separately for resistance and capacity. The grids are mounted on three mica-insulated tie-rods and are suspended and insulated from the ventilated end plates.

The grid bosses through which current is carried are ground parallel and smooth. Connections are made by solid copper strips held between these bosses on one end and by bolting to the switch contact busbar. This method presents breakage, loose connections at point of contact, eliminates resistance joints and reduces heating.

The operating panel is of ebonite board, on which is mounted the contactor mechanism. This consists of renewable current-carrying contact studs and contact fingers which are brought into circuit by raising the cam action toggles. This locks the



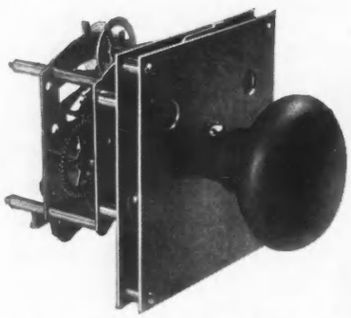
contact fingers firmly against the contact studs, making a secure connection that will not arc. A slight pull on the toggle releases the pressure and breaks the circuit.

Each contactor controls one section of resistance which may be introduced into the circuit as required.

Voltmeter and ammeter are mounted on a swinging bracket attached to the side of rheostat panel. Instruments can be moved to allow reading from any angle.

## Walser Automatic Timer

Walser Automatic Timer Co., 342 Madison Ave., New York City, has placed on the market its Model 615C coin-operated timer for use on such devices as radio receivers, music boxes, exercising machines and other similar apparatus used in public places. This coin-operated timer, made for coins of any denomination and for any period of time, from five to sixty minutes, is supplied to manufacturers without housing, being usually built into the appliance

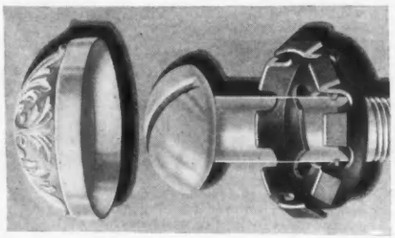


or placed in a special housing supplied by the manufacturer for his own requirements.

The circuit breaker used in the timer is a standard toggle switch, and the circuit will not close until a coin of the proper denomination has been placed in the slot and a knob or handle turned the proper distance. The time control is put into motion when the knob is released and permitted to turn back automatically to neutral, where it is locked and not released until another coin is inserted.

## Rawlplug Lok-Crowner

The Rawlplug Co., Inc., 66 W. Broadway, New York City, has placed on the market a device known as the Rawlplug Lok-Crowner, which is essentially a composition lock washer and a crowner for the heads of screws, bolts, nuts and other fastening devices. It locks, seals and con-



ceals all of these fastenings; is made of brass in all sizes and finishes. In application the lock washer is placed in position in the usual manner, and after tightening the bolt or screw, the cap is placed over the lock washer and attached to it by means of a special punch.

## Brawley Felt Feet

T. R. Brawley Felt Co., Inc., 279 Twentieth St., Brooklyn, N. Y., is introducing to the trade an improved type of felt feet for attachment to such articles as make use of such protective devices. This product consists essentially of two pieces of brass, between which has been placed one piece of heavy felt. The two brass plates, holding the felt, are pressed into a convex form with the felt extending below their lower

edges, and the plates are held in position by means of a husky hollow rivet, sufficiently large to permit of the use of screws or bolts of ample size for attaching the feet. The feet overall are about ½ in. in height and approximately 1 in. in diameter, and when four are used will withstand a pressure of 200 lb. without breaking down. Ordinarily the felt feet are nickel plated, but they may be had in oxidized and other finishes when desired.

## Automatic Voltage Regulator

Marshall Electric Co., Elkhart, Ind., announces an automatic voltage regulator for alternating- and direct-current generators from the smallest to the largest systems. It consists of a carbon pile resistance unit in series with the field of a direct-current exciter or generator. The carbon pile is compressed by gravity and released by an electro magnet. The weight of the parts and the pull of the magnet balance. No springs are used. It is rugged and substantially made with no wearing parts.

In conjunction with very large direct-current generators and exciters for large generators, the regulator is used to adjust the speed of an adjustable speed motor-driven rheostat or a large magnet-operated rheostat. There are no make and break

*You know what they say about the chain and its weakest link*—**a portable tool motor is as dependable as its commutator**

Portable electric tools get about as much *gentle* handling as a steam shovel—hard jolts, sudden starts and stops, tough material—these tools get a tough deal.

Any structural, mechanical or electical weakness in the commutator of the motor will be first to show up—that tool is out of a job and in for an overhauling.

Homer Commutators keep portable electric tools on the job by reason of their out-of-the-ordinary excellence. They are designed and made by commutator specialists who are familiar with the demands imposed upon motors of this type.

**HOMER COMMUTATOR CORP.**
*4748 Hough Avenue*
CLEVELAND, OHIO

# HOMER COMMUTATORS

Better commutators and other parts — at reasonable prices.

Make "EUREKA" your regular source of supply for commutators, and other parts such as—

**Commutator Bars (forged, drawn or cast). Brush Holders. Copper Leaf and Gauze Brushes. Controller Fingers, Segments, Field Plates, etc. Switches. Non-ferrous Castings and Drop Forgings.**

Dependable prompt deliveries of highest quality parts, at reasonable prices.

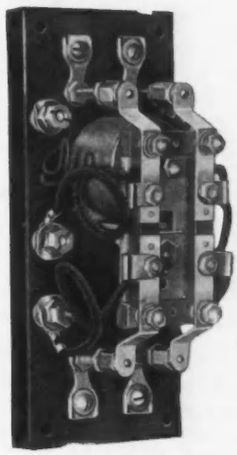
Let us figure with you on all or part of your requirements. Write us.

**EUREKA METAL PRODUCTS CORPORATION**
91 Clay Street, North East, Pa.

**Eureka**

Again—

"DUNCO" originates a new relay!



Type DDBL8

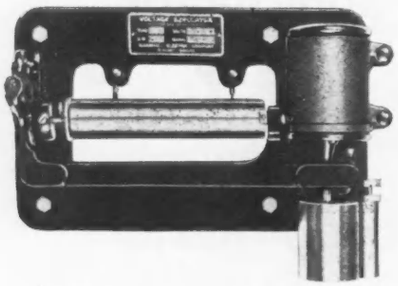
—a double pole, double throw relay with four separate circuits. It snaps into action *instantly* and can be depended on for a lifetime of service. It is one of a hundred DUNCO relays for a hundred different jobs and, if a *special* relay is needed, DUNCO will build it.

**STRUTHERS DUNN, Inc.**
138 North Juniper St.,
Philadelphia, Pa.

contacts of any kind. The adjustment is very simple and when once set will remain in that exact setting.

The improved design electro magnet is exceedingly sensitive, and these regulators are giving excellent service in many severe applications.

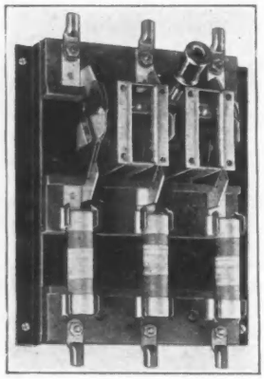
These regulators are in successful use



as speed regulators on adjustable speed shunt wound direct-current motors on paper making machinery, etc. Also they are suitable for assisting synchronous alternating-current motors on exceedingly variable loads in maintaining power factor.

## Paramount Knife Switch

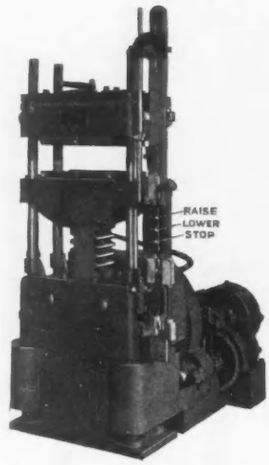
Paramount Electric Mfg. Co., 141 Tenth St., San Francisco, Cal., is marketing a quick double make-and-break toggle heavy-duty knife switch which is available in 30, 60, 100, 200 and 400 amperes, 250 volts and 500 volt capacities. The construction of the Paramount mechanism is based on the principle of compound leverage and is independent of the spring, which is used mainly to facilitate the throw rather than to actuate it. The movement of the



blades is actuated by a lever handle, pivoted externally of and pulling both ways against the blade carrying yoke. Provisions have been made in the construction of the spring actuating mechanism, so that the switch can be disconnected should a spring fail, but it cannot be connected if a spring is broken until the spring has been replaced. Switches of 100 amperes and under are 3½ in. deep, and those over 100 amperes are 6 in. in depth.

## Synthetic Hot Moulding Spring Press

Terkelsen Machine Co., 326 A St., Boston, Mass., is manufacturing a Type E-1, Model 50 synthetic hot molding spring press of 50 tons' capacity. Its source of power is an electric motor operating through a train of gears to a rack pressed into the lower bed. The motion of this bed brings into action four specially constructed powerful springs, acting as an accumulator that maintains the pressure and follows up the physical changes or contraction of material in the curing process. The purpose of the motor is that of clos-




ing and opening the press, and during the curing period the motor may be stopped. The stroke of the press, the pressure exerted and the position of the platens may be adjusted to suit operating conditions. Any type of mold and any kind of materials may be used. The working area of the platens is 18½ in. by 12½ in.

## Rockbestos Magnetic Wire

The Rockbestos Products Corp., New Haven, Conn., manufacturers of asbestos insulated wires and cables, announces a magnet wire and asbestos insulation and having a uniform diameter no greater than double cotton covered magnet wire. Size 15 B. & S. gage and smallller at much lower prices than heretofore.

This new magnet wire at lower cost is made possible by an entirely new process developed by Rockbestos engineers.

The new magnet wire can be used in motors, coils, etc., in the same space formerly occupied by double cotton covered magnet wire.

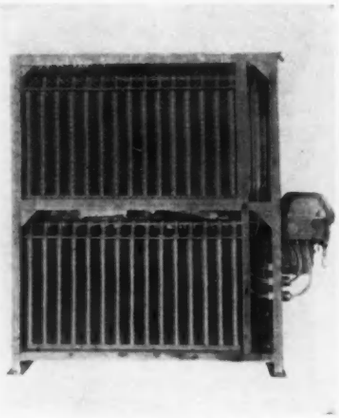
## E-M Improved Cell Type Capacitors

The Electric Machinery Mfg. Co. of Minneapolis, Minn., has announced an improved line of cell type capacitors for use in power factor improvement. These capacitors are built for either indoor or outdoor use, the outdoor type capacitor being completely inclosed in a sheet steel housing.

The E-M capacitor consists of an assembly of capacitor cells securely mounted on a rugged steel stand. Each cell is a complete capacitor unit, and by connecting two or more cells in parallel, any desired kv-a. may be obtained.

A feature of the E-M cell type capacitor is the cylindrical roll, which is the working element in the capacitor cell. The cylindrical form of construction prevents undue mechanical stress on the tissue, thus insuring long life.

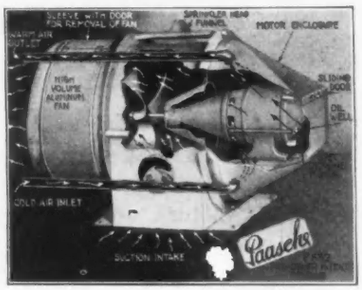
The individual capacitor rolls are mounted on a supporting rack and sealed under oil in the cell. The cell containers are substantially built from 18 gage sheet



steel and have welded oil tight joints. Stands for holding the cells are of welded sheet steel construction.

## Paasche Explosion-Proof Ventilating Unit

Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, Ill., announces a motor-operated, fully inclosed explosion-proof ventilating unit for the circulation and cooling of air in painting and finishing rooms. These devices have a specially designed aluminum fan, special motor with sealed sleeve bearings, clean-out door for quick removal of fan, special oiling features for the motor and a housing designed for flexi-




bility in mounting. The motor housing completely seals the motor, and a flexible pipe supplies air from the outside for cooling purposes. The devices show anemometer readings at 1750 r.p.m., ranging from 2900 cu. ft. of air displacement to 12,000 cu. ft., and according to their capacity are driven by electric motors ranging in size from ¼ h.p. to 2 h.p. They are available in both alternating and direct current of varying voltages and phases.

## Sorgel Booster Auto Transformers

In the December, 1929, issue of Electrical Manufacturing, page 80, was a statement that the Type BT Booster Auto Transformers, manufactured by the Sorgel Electric Co., 91 W. Water St., Milwaukee, Wis., were made in sizes ranging from 75 to 150 kv-a. This statement was incorrect and should have read that these types of transformers, as manufactured by this company, were made in sizes ranging from 1 to 500 kv-a.

# *Chromium*

## the *wanted* finish

The modern housewife wants brilliancy in her home equipment—without hard labor! She knows all about CHROMIUM . . . knows how its permanent blue-white brilliance is in keeping with the modernistic trend . . . she knows it needs no polishing. . . . . .

United Chromium, Inc., renders a licensing service which assures manufacturers of the finest Chromium Plate on a definite production basis. It would be a pleasure to explain details of this service or provide names of our jobbing licensees who would be glad to cooperate in the event your needs do not justify your own plating department.

Executive Office
51 East 42nd St.
New York City

# UNITED CHROMIUM

*Chicago Cleveland Detroit* INCORPORATED *San Francisco Waterbury, Conn.*

# *Index of Raw Materials, Parts, Electrical Equipment*

## *For all electrical products including electrically operated machines and appliances*

### Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

*Note:* The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore.

### ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

### ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.

**AMMETERS.** See Instruments.

### ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

**ARMATURE & COIL SPRAY GUNS.** See Spraying Outfits.

**ARMORING MACHINES.** See Wire Manufacturing Machines.

**ARMS, FLEXIBLE.** See Tubing Flexible Metallic.

**ASBESTOS** Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

### ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.

### ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Decelco, Inc., Wayne, Mich.
Electrobestos. See Johns-Manville Corp.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Decelco, Inc.

### BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

**BAKELITE MOULDS.** See Dies, Die Makers.

### BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

**BALL BEARINGS.** See Bearings, Ball and Roller.

### BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Sidlon Company, Frank, Boston, Mass.

**BARRIERS, Switchboard.** See Slate; also Soapstone; also Asbestos.

**BARS, BUS.** See Brass, Bronze & Copper; also Aluminum.

### BARS, Commutator
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Homer Commutator Co., 4748 Hough Ave., Cleveland.
Rome Brass & Copper Co., Div. of Revere Copper & Brass, Inc., Rome, N. Y.

**BASES, Radio Tube.** See Radio Molded Parts.

### BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

**BATTERY CHEMICALS.** See Chemicals, Battery.
**BATTERY CUT OUTS.** See Switches, Battery.
**BATTERY GAGES.** See Instruments, Pocket.
**BATTERY JARS.** See Jars, Battery, Glass; also Rubber; also Molded Insulation.
**BATTERY OXIDES.** See Chemicals, Battery.
**BATTERY SALTS.** See Chemicals, Battery.
**BEAD CHAIN.** See Chain, Socket.
**BEADS, Chandelier.** See Crystals, Chandelier.

### BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Durco. See Struthers Dunn, Inc.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

### BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

### BEARINGS, Ball and Roller
Aetna Ball Bearing Mfg. Co., 4610 Schubert Ave., Chicago, Ill.
Ahlberg Bearing Co., 312 E. 29th, Chicago, Ill.
Auburn Ball Bearings Co., 73 Clarissa, Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schebler. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

### BEARINGS, Oil-Less
Argute Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 125 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

### BEARINGS AND BUSHINGS
(For Armature Shafts.)
Adjustable Bearing Co., 101 Transportation Bldg., Indianapolis, Ind.
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Durex. See Moraine Products Co.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., First & Foundry Sts., Dayton, O.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

**BELTING, Chain Transmission.** See Chain, Power Transmission.

### BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Dayton Rubber Mfg. Co., Dayton, O.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Todd Drain-A-Tub Co., 1108 Walnut, Kansas City, Mo.

### BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

**BENDING.** See Punching & Bending.
**BINDING POSTS.** See Posts, Binding.

### BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.

**BLUESTONE.** See Chemicals, Battery.
**BOARD, Fuller.** See Cloth and Paper.
**BOARD, Press.** See Cloth and Paper.
**BOMBARDING MACHINES.** See Machines, Lamp Making.
**BOWL HOLDERS.** See Fixture Fittings.
**BOX & CABINET BUSHINGS.** See Bushings, Box & Cabinet.

### BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago.
Mid-West Box Co., 111 W. Washington, Chicago.

### BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., 111 W. Washington, Chicago.
**BOXES, Sheet Steel.** See Cabinets, Sheet Steel.
**BOXES, Wood.** See Cabinets & Boxes, Wood.

### BOXES AND WRAPPERS
Agar Mfg. Corp., Whippany, N. J.
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 325 Decatur, Sandusky, Ohio.
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O. (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago
National Folding Box Co., New Haven, Conn. (Cartons.)
Pequot Mfg. Corp., Glendale (L. I.), New York.
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Rockford Fibre Container Co., Rockford, Ill.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.

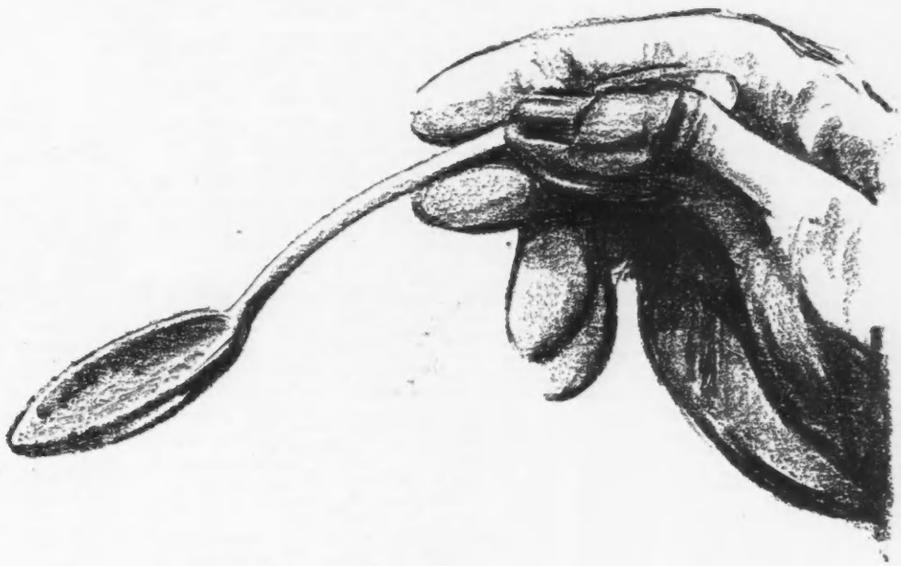
### BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**BRAIDING MACHINES.** See Wire Manufacturing Machines.
**BRASS TUBING.** See Tubing, Brass and Copper.

### BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
American Nickeloid Co., Peru, Ill.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, Div. of Revere Copper & Brass, Inc., Baltimore, Md.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Electric Materials Co., North East, Pa.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Higgins Brass & Mfg. Co., Div. of Revere Copper & Brass, Inc., 12435 Dequindre, Detroit, Mich.
Johnson Bronze Co., New Castle, Pa.
Michigan Copper & Brass Co., Div. of Revere Copper & Brass, Inc., 5851 W. Jefferson Ave., Detroit, Mich.
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Div. of Revere Copper & Brass, Inc., Taunton, Mass.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)
Western Cartridge Co., East Alton, Ill.

**BREAKERS, Circuit.** See Circuit Breakers.
**BRIDGES, Wheatstone.** See Instruments, Laboratory Standard.
**BRONZE.** See Brass, Bronze and Copper; also Castings.
**BRONZE, Phosphor.** See Phosphor Bronze.
**BRONZE POWDER, Aluminum.** See Aluminum.
**BRUSH HOLDERS.** See Brushes, Commutator.
**BRUSHES, Carbon.** See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

### BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W
Automotive Mfg. Co., Kansas City, Mo. ..... H
B. B. B. See Becker Bros. Elec'l Corp.



# THESE SPOONS SELL TWO FOR 5 CENTS—

YOU can buy them in any of the larger chain stores—chromium plated. What has this to do with your business? Spoons probably have nothing to do with it. But these spoons tell a story of interest to every electrical manufacturer. For by the application of chemical engineering to the process of chromium plating, the Hobson Flatware Company of Lambertville, New Jersey, has been able to cut the plating cost to 14c. per gross—less than the cost of the nickel plate which chromium has replaced.

Here is a typical example of production costcutting which is the direct result of our specialized knowledge and experience in chromium-plating.

The price tag on these spoons is significant of other achievements where we have been called in to solve difficult problems in chromium plating. It is typical of what is going on in the many plants that have employed our services—every plant proud of its achievements—and ours.

Your chromium plating problems may be different. But whatever they are, we shall welcome the opportunity to serve you.

No royalties or license fees. Patent protection guaranteed.

WEISBERG & GREENWALD

Engineers - Chemists
71 West 45th Street
New York City

**BRUSHES, Commutator**—Continued
Baylis Co., Bloomfield, N. J. . . . . H
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill. . . . . C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. . . . . C
Bezill-Bruel Carbon Co., Columbia Park, O. C . . . H
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. . . . . C
Carbon Engrg. Co., Slinger, Wis. . . . . C . . . L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. . . . . C
Carbon & Graphite Corp., 227 West Broadway, New York, N. Y. . . . . C
Carenco. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. . . . . C W S . . L
Columbia Machine Wks., & M. I. Co., 263 Chestnut, Brooklyn, N. Y. . . . . H
Cooley Mfg. Co., 98 Park Place, New York . . W
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City. . . . . .
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa. . . . . H
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa. . . . . C
Eureka Metal Products Corp., 91 Clay, North East, Pa. . . . . W S H
Fleck Carbon Co., 508 Broome, New York C . . . H
General Electric Co., Schenectady, N. Y. . . . C . . . H
Graphalloy. See Graphite Metalizing Corp.
Graphite Metalizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. . . . . C . . . H
Henrite Products Co., 98 Park Place, New York, N. Y. . . . . C
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio . . . . . H
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) . . . . . C
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. . . . . C
Kohlenite Products Co., 92-34 152nd St., Jamaica, N. Y. . . . . C
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y. C
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. . . . . C
Morganite Brush Co., 38-02 48th Ave., Long Island City, N. Y. . . . . C
National Carbon Co., Cleveland, O. . . . . C
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. . . . . C . . . L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio . . . . . C W . . . L
Ohio Elec. Specialty Mfg. Co., Troy, O. . . . W
Perfection Supply Co., 98 Park Pl., New York, N. Y. . . . . C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. . . . . C
Pure Carbon Co., Wellsville, N. Y. . . . . C W S . . L
Pyramid. See National Carbon Co.
Rosetion. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. . . . . W . . . . L
Salem Electrical Supply Co., Salem, Mass. . . W
Scarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. . . . . C
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. . . . . C . . . . . L
Speer Carbon Co., St. Mary's, Pa. . . . . C
Stackpole Carbon Co., St. Mary's, Pa. . . . . C
Sterling. See Carbon Laboratories Co.
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y. . . . . C
U. S. Graphite Co., Saginaw, Mich. . . . . C
Universal. See Graphite Metalizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C . . . . . L
**BRUSHES, PNEUMATIC SPRAYING.** See Spraying Outfits, Sts.

## BRUSHES FOR VACUUM CLEANERS
Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
**BUGGIES, Armature.** See Lifts, Armature.

## BULBS, Glass
For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.
**BUNCHING MACHINES.** See Wire Manufacturing Machines.
**BUS BAR.** See Brass, Bronze and Copper. Also Aluminum.
**BUSHINGS, SHAFT.** See Bearings and Bushings.

## BUSHINGS, Box and Cabinet, Porcelain
Appleton Electric Co., 1704 Wellington Ave., Chicago, Ill.
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elect. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineralac Electric Co., 25 N. Peoria, Chicago, Ill.
Multi Electric Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.
**CABINET GRILL CLOTH** See Cloth, Untreated.

## CABINETS, Fibre
Continental-Diamond Fibre Co., Bridgeport, Pa.
Vulcawood. See Continental-Diamond Fibre Co.
**CABINETS, Refrigerator.** See Refrigerator Cabinets.

## CABINETS, Sheet Steel
Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel-Equip. Co., Aurora, Ill.



American Metal Wks., 4868 Stanton Ave., Philadelphia, Pa.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Artisan Sheet Metal Corp., 53 Gorham, Rochester, N. Y.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1375 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 551 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Chicago Hdwe. Foundry Co., North Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 73 E. Sixth, Portland, Ore.
Cole Electric Products Co., 33 Crescent, Long Island City.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Creiger Electrical Mfg. Co., 609 W. Lake, Chicago, Ill.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Apparatus Co., 704 N. Halsted, Chicago, Ill.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Federal Basel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dail Mfg. Co., 311 N. Tenth, Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Par-Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezloh. See Holzer Sheet Metal Works.
Robbins & Myers, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 2338 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 420 Schreyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Colt, Irvington, N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wiegman & Co., E. M., 1908 Benton, St. Louis, Mo.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

## CABINETS AND BOXES, Wood
Accurate Molding Corp., 20 Morton, Brooklyn, N. Y.
Adler Mfg. Co., Louisville, Ky.
Adler Royal. See Adler Mfg. Co.
Ampere. See Donehue Lumber Co.
Art Woodworking Co., Inc., 1035 Seattle Blvd., Seattle,
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Blackhawk Furniture Co., Rockford, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carlon. See Art Woodworking Co.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cary Cabinet Corp., 1427 N. 15th, St. Louis Mo.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chickasaw Furniture Mfg. Co., Memphis, Tenn.
Conrades Mfg. Co., 1942 N. Second, St. Louis, Mo.
Conner Furniture Co., New Albany, Ind.
Continental Radio Corp., East Pontiac, Extended, Fort Wayne, Ind.
Corbett Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Deiker Co., Geo., Henderson, Ky.
Ebert Furniture Co., 225 W. 34th, New York, N. Y.
Effein & Rena, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excel Phonograph Mfg. Co., 400 W. Erie, Chicago, Ill.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Federal Wood Products Corp., 206 Lexington Ave., New York, N. Y.
Findlay Mfg. Co., Metropolitan & Morgan Aves., Brooklyn.
Furnas Furniture Co., 139 East, Indianapolis, Ind.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
Kiel Furniture Co., 32nd and Center Sts., Milwaukee, Wis. (Radio Table).
King Mfg. Corp., 254 Rano, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Knoxville Table & Chair Co., Knoxville, Tenn.
National Cabinet Co., New Philadelphia, O.
New England Box Co., Greenfield, Mass
Ohio Valley Cabinet Co., Wheeling (Warwood), W. Va.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Phono-End-Table. See Continental Radio Corp
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago,



Radio Cabinet Mfg. Corp., Furniture Mart, Chicago, Ill.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pilliod Lumber Co., Swanton, O.
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Showers Bros. Co., Bloomington, Ind.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Starr Piano Co., Richmond, Ind.
Stettner Phonograph Corp., 669 Kent Ave., Brooklyn, N. Y.
Studner Bros., 67 W. 44th, New York, N. Y.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355-Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
West Box Co., 235 Liberty, Springfield, Mass
Wood Cabinet Corp., 196 Lexington Ave., New York, N. Y.
**CABLE ARMORING MACHINES.** See Wire Manufacturing Machines
**CABLE TEST SETS.** See Instruments, Portable and Switchboard.
**CABLING MACHINES.** See Wire Manufacturing Machines.

## CANDLES, Fixture
Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington.
Cleveland Container Co., 10619 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N. Y.
Phoenix Glass Co., Monaca, Pa.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.
**CANOPY (Canopies).** See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.
**CAPACITORS, RADIO.** See Radio Circuit Components.

## CARBON, Powdered
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich
**CARBONS, Battery.** See Carbons.
Arc Light. See Carbons.

## CARBONS
Battery Arc Light.
Becker Bros. Elecl. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Leasing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
**CARTONS.** See Boxes and Wrappers.
**CASEIN PLASTICS.** See Molded Insulation.
**CASES, Eliminator.** See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

## CASES, Eliminator
Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y.
Karp Metal Products Co., 129 30th, Brooklyn.

## CASES, Flashlight
Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.
**CASTINGS, Aluminum.** See Castings, Aluminum. Also Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

## CASTINGS, Aluminum
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh
Bergen Point Brass Foundry, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohm Aluminum & Brass Corp., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland.
National Bronze & Aluminum Foundry Co., 88th & Lake, Cleveland O.
Quality Aluminum Casting Co., Waukesha, Wis.
Tenual. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn.
Veco Mfg. Co., South Norwalk, Conn.

## CASTINGS
Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass
Barnard Foundry Co., 9 Roseland, Springfield, Mass.
Bergen Point Brass Foundry, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohn Aluminum & Brass Corp., Detroit.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Davis & Zuckerman, 514 E. 11th, New York, N. Y.
Delta Star Electric Co., 2437 Fulton, Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Faries Mfg. Co., Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Harsch, John, Bronze & Foundry Co., 11612 Madison Ave., Cleveland, O.
Johnson Bronze Co., New Castle, Pa.
McGill Metal Co., Valparaiso, Ind.



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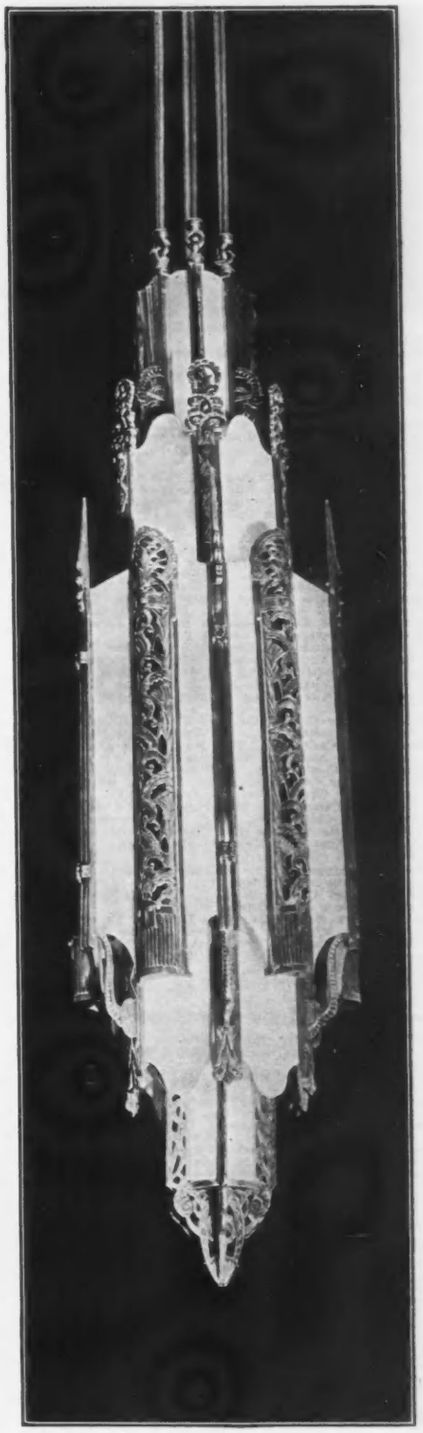

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**CASTINGS**—Continued
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.
Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Sterling Art Metal Wks., 30 Purvis, Long Island City, N. Y.
Tenual. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn.

**CASTINGS, Die**
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Alemite Die-Casting & Mfg. Co., Woodstock, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Aluminum Industries, Inc., 2438 Beekman, Cincinnati, O.
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Badger Die Casting Co., 155 Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 551 W. Congress, Chicago, Ill.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., 146 Munson, New Haven Conn.
Paragon Die Casting Co., 2701 N. Crawford Ave., Chicago.
Permite. See Aluminum Industries, Inc.
Phoenix Die Castings Co., 21 Illinois, Buffalo, N. Y.
Pittsburgh Die Casting Co., 7508 Ardmore, Swissvale, Pa.
Precision Die Casting Corp., Syracuse, N. Y.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

**CASTINGS, Gray iron**
American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Fairmount Foundry, Inc., Third & Westmoreland Sts., Philadelphia, Pa.
Farquhar Co., A. B., York, Pa.
Forest City-Walworth Run Fuondries Co., 2500 W. 27th, Cleveland, O.
Gray Iron Foundry Co., Reading, Pa.
Laytham & Son, Co., Wm. P., Market & E. 34th, Paterson, N. J.
Milwaukee Grey Iron Foundry Co., 3910 Mitchell, Milwaukee, Wis.
North Lebanon Foundry Co., Second & Canal, Lebanon, Pa.
North Wales Mach. Foundry Co., North Wales, Pa.
Products Machine Co., Bridgeport, Conn.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.
Snead & Co. Pine St., Jersey City, N. J.
Union Mfg. Co., New Britain, Conn.
Western Foundry Co., Kedzie Ave. at 36th, Chicago, Ill.

**CASTINGS, Malleable Iron**
Eastern Malleable Iron Co., Naugatuck, Conn.
Southern Malleable Iron Co., 21st & Bond Ave., East St. Louis, Ill.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo.

**CASTINGS, Steel**
Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark
Northwestern Steel & Iron Corp., 2907 Fourth, S. E., Minneapolis, Minn.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Proctsm. See Northwestern Steel & Iron Corp.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

**CEMENT, Commutator**
Anchorlute. See Technical Products Co.
Commutator Companion. See Withington Div. of Marnot Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Fixkwick. See Technical Products Co.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Withington Div. of Marnot Co., 50 Thayer, Boston, Mass.

**CEMENT, Liquid Porcelain**
Anchorlute. See Technical Products Co.
Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Patch-O-Namel. See Technical Products Co.
Repairet Mfg. Co., Milwaukee, Wis.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Technical Products Co., Pittsburgh, Pa.
Thermold. See Technical Products Co.

**CHAIN, Chandelier (Fancy).** See Crystals, Chandelier.

**CHAIN DRIVES.** See Chain, Power Transmission.

**CHAIN, Fixture**
Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.



Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.

**CHAIN, Power Transmission**
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

**CHAIN, Socket**
American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.

**CHANDELIER BEADS.** See Crystals, Chandelier.

**CHANDELIER CRYSTALS.** See Crystals, Chandelier.

**CHANDELIER FRINGE.** See Crystals, Chandelier.

**CHARGERS, Magnet**
Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo
Scintilla Magneto Co., Inc., Sidney, N. Y.
Serrwell Sales Corp., 1749 N. Winchester Ave., Chicago
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

**CHEMICALS, Battery**
Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Conner & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electrex. See Goodyear Chemical Co., Inc.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Goodrear Chemical Co., Inc., 20 W. 22nd, New York, N. Y.
Grasselli Chemical Co. Guardian Bldg., Cleveland, O
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klinstein Co., 644 Greenwich, New York, N. Y.
Lightning Co., St. Paul, Minn.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah See Powers-Weightman-Rosengarten Co
Wah Chang Trading Corp., 233 Broadway, New York, N. Y

**CHEMICALS, Refrigeration**
Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating See Plating & Finishing.

**CHUCKS, Magnetic**
J & H Elec. Co., 200 Richmond, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

**CIRCUIT BREAKERS**
Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 269 A, Boston, Mass
Anderson & Co., C. J., 212 W. Austin Blvd., Chicago, Ill.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 858 Summer St. (South Boston), Boston Mass.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee. (Mercury Type).
Domestic Elec. Co., Kent, O.
General Electric Co., Section W-234, Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hartman Electrical Mfg. Co., 31 E. Fifth, Mansfield, Ohio.
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hiltesco. See High Tension Elecl. Specialty Co.
H. & H. See Hart & Hegeman Div.
Inducto-therm. See Allen-Bradley Co
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibreaker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 209 Rawson, Long Island City, N. Y
Timo-O-Stat Controls Co., Cramblett Engineering Div. 255, Milwaukee Ave., Milwaukee, Wis.
U-Re-Lite. See I. T. E. Circuit Breaker Co
Westinghouse Elec. & Mfg. Co., East Pittsburgh Pa

**CIRCUIT TESTERS.** See Testers, Fuse and Circuit

**CLEANER BAGS, Vacuum.** See Bags, Vacuum Cleaner

**CLEANER BRUSHES, Vacuum.** See Brushes for Vacuum Cleaners

**CLEANERS, Metal**
Oakite Products, Inc., 26 Thames, New York, N. Y.

**CLIPS, Fuse.** See Fuse Clips.

**CLIPS, Heater Plug**
Gray Bros. Co., Piano, Ill.

**CLOCK SWITCHES.** See Switches, Time.

**CLOTH GEARS.** See Gears and Pinions, Composition.

**CLOTH LOUD SPEAKER DIAPHRAGM.** See Cloth, Untreated.

**CLOTH RADIO GRILL.** See Cloth, Untreated.

**CLOTH, Untreated**
Boyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y
Pindall Fabrics Corp., 200 Madison Ave., New York, N. Y. (Grill Cloth).

**CLOTH AND PAPER, Insulating**

| | |
|---|---|
| Cloth, Insulated | See C |
| Paper, Insulated | See P |
| Fibre Paper (Fish Paper) | See F |
| Press Board (Fuller Board) | See B |
| Silk | See S |

Acme Wire Co., New Haven, Conn. C S P
Armco. See Rogers Paper Mfg. Co.
Armegite See Mica Insulator Co.
Behr-Manning Corp., Troy, N. Y. P
Brand & Co., Wm. 268 4th Ave., New York. P
Campbellite. See National Vulcanized.



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Case Mfg. Co., Unionville, Conn. P
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Celoron Co., Bridgeport Pa. P F B
C-F. See National Vulcanized Fibre Co.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind. C
Columbian Rope Co., Auburn, N. Y. P
Continental-Diamond Fibre Co., Bridgeport, Pa. P
De Jonge & Co., Louis, 69 Duane, New York, N. Y. (Condenser) P
Dexster. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)
Dielectric Mfg. Co., St. Louis, Mo. C S P B
Electrite. See West Virginia Pulp & Paper Co.
Fyberoid. See Wilmington Fibre Specialty Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn. C P
Ghandise Dept., Bridgeport, Conn. C P
Hartford City Paper Co., Hartford City, Ind. (Glassine Condenser Tissue).
Hewitt & Bree., C. B., 16 Ferry, New York C P
Hi-Tex See Stevens Paper Mills.
Hollingsworth & Vose Co., 333 Washington, Boston, Mass. P
Insulation See Tarentum Paper Mills Co.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y. F
Irvington Varnish & Insulator Co., Irvington, N. J. C S P
Manning Paper Co., J. A., Troy, N. Y. B
Mica Insulator Co., 200 Varick, New York C S P B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. P
National Vulcanized Fibre Co., Wilmington, Del. F
New Jersey Wood Finishing Co., Woodbridge, N. J. C
Ohmoid. See Wilmington Fibre Specialty Co.
Old Hick. See Hewitt & Bros., C. B.
Peerless. See National Vulcanized Fibre Co.
Riegels. See Warren Mfg. Co.
Rogers Fibre Co., 240 Lincoln, Boston, Mass. F
Rogers Paper Mfg. Co., So. Manchester, Conn. B
Schweitzer, Inc., Peter J., 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Sico. See Standard Insulation Co.
Standard Insulation Co., East Rutherford, N. J. C S P
Sterling Fireboard Co., 501 Fifth Ave., New York (Varied Hard Fireboard) B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn. B
Tarentum Paper Mills Co., Tarentum, Pa. P
Turbonite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. P
Warren Mfg. Co., 342 Madison Ave., New York, N. Y. P
West Virginia Pulp & Paper Co., 230 Park Ave., New York B
Wilmington Fibre Specialty Co., Wilmington, Del. P

**CLUTCHES, Magnetic**
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis

**COIL (Coils).**
Armature and Field. See Coils, Finished.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders See Winding Machines, Armature and Field.
Tamping Tools. See Tools, Coil Tamping.
Taping Machines. See Taping Machines, Coil.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

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Armature, Field, Electromagnet and Induction Coils.
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Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Bonnell & Co., J. H., 82 Park Place, New York, N. Y
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co. Ansonia, Conn.
Concourse Electric Co., 294 E. 137th, New York, N. Y.
Cote Coil Div. of Universal Winding Co., Providence, R. I.
Ditmar Elec. Co., Brookline, Mass.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
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National Elec. Corp., 230 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Polymet Mfg. Co., 829 E. 134th St., New York, N. Y.
Reisner Mfg. Co., W. H., Hagerstown, Md.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
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Rome Wire Co. (Div. of General Cable Corp.), Rome, N. Y.
Sevison Magneto Engrg. Co., 397 Phillips, Toledo, O.
States Co., 19 New Park Ave., Hartford, Conn.
Stone & Barron, 210 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co. 2342 Smead Ave., Toledo, O.
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Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Rebilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator
Stones. See Stones, Commutator.
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Truing Devices. See Tools, Commutator Truing.

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Eureka Metal Products Corp., 91 Clay, North East, Pa.
Homer Commutator Co., 4748 Hough Ave., Cleveland.
Toledo Standard Commutator Co., Toledo, O.

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**COMPOSITION PULLEYS.** See Pulleys, Composition.

**COMPOUNDS, Commutator**
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Armstrong. See Elec. Power Maintenance.
Consistency. See Warren Lubricant Co.
Cramolin, Inc., 25 W. 43rd St., New York, N. Y.
Dixon Crucible Co., Jos., Jersey City, N. J.
Doe & Co., Walter S., Kent, Ohio.
Gales. See McLennan & Co.
Goldmark Co., James, 83 Warren, New York, N. Y.
Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.
McLennan & Co., K., 1751 West 35th, Chicago.
Perfection. See Warren Lubricant Co.
Sanderson. See Warren Lubricant Co.
Spermo. See Warren Lubricant Co.
Trotters. See Goldmark Co., James.
Warren Lubricant Co., 22 Maurice, Buffalo, N. Y.

**COMPOUNDS, Sealing.** See Wax and Compounds.

**CONDENSER UNITS, Refrigerator**
Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riopelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.

**CONDENSERS, Radio.** See Radio Circuit Components.
**CONDENSER TUBING.** See Tubing, Brass and Copper.

**CONNECTORS, Pin-Plug**
Kliegl Bros. Universal Electric Stage Lig. Co., 321 W 50th, New York, N. Y.

**CONNECTORS, Wire**
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill. (Solderless-Tapeless).

**CONTACT POINTS.** See Points, Contact.
**CONTAINERS, Shipping.** See Fibre Board Products.

**CONTROLLERS, Motor**
Aclinestor. See Sundh Elec. Co.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York N. Y. (Traffic.)
Burke Controller Co., 505 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond Elect. Mfg. Co., 1230 N. 16th, Los Angeles, Cal.
Dinkey. See Elec. Controller & Mfg. Co.
Dunco. See Struthers Dunn, Inc.
E C & M Youngstown. See Electric Controller & Mfg. Co.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Hercules. See Union Elec. Mfg. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover, Milwaukee, Wis.
Mainin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Guy, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave. Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd. Chicago, Ill.
Resisto. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md
Square D Co., 6060 Rivard, Detroit, Mich.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.



Thermoload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Unelco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis.
Ward Leonard Elec. Co., 31 South, Mount Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

**COPPER.** See Brass, Bronze and Copper; also Castings
**COPPER TUBING.** See Tubing, Brass and Copper.
**CORD TIPS.** See Tips, Cord.
**CORD, Tinsel.** See Tinsel Cord & Thread.

**CORDS, Extension**
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

**CORES, RESISTANCE COIL (Lava)**
American Lava Corp., 1435 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Ee-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1435 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

**CORES, RESISTANCE COIL (Refractory Porcelain)**
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Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 1 Central Ave., West Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Firelite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitrecell. See Thermal Syndicate.
Woolley, Inc., W. Douglas, East Liverpool, O.

**COTTON DUCK.** See Cloth, Untreated.
**COTTON SLEEVING.** See Tape, Cotton.
**COUNTERS, Revolution.** See Tachometers.

**COUPLINGS, Shaft (Flexible-Insulated)**
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett Hayward Co., Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Brown Engineering Co., 123 N. Third, Reading, Pa.
Falk Corp., Milwaukee, Wis.
Delbee Rubber Co., Syracuse, N. Y.
Francke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Kanti Lever. See Brown Engineering Co.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 4125 W. Ohio, Chicago, Ill.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 5 Halsey, Newark, N. J.
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.

**COVERING MACHINES, WIRE.** See Wire Manufacturing Machines

**CRUCIBLES, Porcelain.** See Porcelain.

**CUPS, Grease**
Bowen Products Corp., Auburn, New York.
Gits Bros. Mfg. Co., 1940 S. Kilbourn Ave., Chicago, Ill.
Lunkenheimer Co., Cincinnati, Ohio.

**CUPS, Oil**
Gits Bros. Mfg. Co., 1940 S. Kilbourn Ave., Chicago, Ill.

**CUT OUTS, Battery.** See Switches, Battery.
**CUTTING OUTFITS, Metal.** See Welding and Cutting Outfits.

**CRANES, Floor.** See Lifts, Armature.

**CRYSTALS, Chandelier**
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Fosilite. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 386 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

**CURRENT INDICATORS.** See Instruments, Pocket.
**DASHBOARD METERS.** See Instruments, Portable and Switchboard.

**DECALCOMANIA**
Meyercord Co., 120 S. La Salle, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

**DIALS**
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

**DIALS, Enameled**
Whittier Co., Horace R., Pequabuck, Conn.

**DIAPHRAGM, Cloth.** See Cloth, Untreated.
**DIE CASTINGS.** See Castings, Die.
**DIE MAKERS.** See Dies, Die Makers.

**DIE SETS**
Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.
**DIES, Pipe.** See Stocks, Dies and Reamers.



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Caldbeck Tool & Mfg. Co., 307 East Third, Des Moines, Iowa.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Madison-Kipp Corp., 211 Waubesa, Madison, Wis.
Marsch & Nobel, 250 Greenwich, New York, N. Y.
Plymouth Mfg. Co., 2148 Walnut, Chicago, Ill.

**DIMMER, Theatre**
Ward Leonard Elec. Co., 31 South, Mount Vernon, N. Y.

**DISCS, Armature**
Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Johnson, H. D., 170 Mahncke Court, San Antonio, Texas.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.
Niagara Machine & Tool Wks., 637 Northland, Buffalo.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Willor Mfg. Corp., 117 Mercer, New York, N. Y.

**DRAWING MACHINES, WIRE.** See Wire Drawing Mach.
**DRIVE SCREWS.** See Screws, Drive.
**DRIVES, CHAIN.** See Chain, Power Transmission.

**DYNAMOMETERS**
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady.

**EBONITE.** See Rubber, Hard.
**ELECTROLYTE.** See Chemicals, Battery.
**ELECTROMAGNETS.** See Coils, Finished.

**ELECTRODES FOR GAS SIGNS**
American Neon Sign Corp., 549 W. 132nd St., New York.
Elster Electric Corp., 756 S. 13th, Newark, N. J.
Machlett & Son, 50 William, Long Island City, N. Y.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Ohio Neon Lamp Corp., Highland Ave., (Norwood) Cincinnati, O. (Housings)
Q. R. S. De Vry Corp., 333 N. Michigan Ave., Chicago.

**ELECTRODYNAMOMETERS.** See Instruments, Laboratory Standard.
**ELEMENTS, Heating.** See Units, Rods and Grids.

**ENAMELING MACHINES (For Magnet Wire)**
(See Also Wire Manufacturing Machines).
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Sleeper & Hartley, Inc., 335 Chandler, Worcester, Mass

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Deckel. See Preis & Co., Inc., H. P.
Elster Electric Corp., 756 S. 13th, Newark, N. J. (Tube Base Branders)
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Preis & Co., Inc., H. P. Newark, N. J.
Schmidt, Inc., Geo. T., 4100 Ravenswood Ave., Chicago, Ill.

**ENGRAVING, Radio Panel**
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Mechanical Engraving Co., 130 Orchard, Newark, N. J
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.
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Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati
Wright Radio Co., 114 Exchange, Rockland, Mass.

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Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn.
Waterbury Button & Moulding Co., 835 S. Main, Waterbury, Conn.

**FABRIC, Radio Grill.** See Cloth, Untreated.
**FABRIC SHADES.** See Shades, Fabric.
**FAN BLADES.** See Blades, Fan.

**FEET, Felt**
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.
Mattatuck Mfg. Co., Waterbury, Conn.

**FELT**
American Felt & Gutting Co., 800 W. Lake, Chicago, Ill.
American Felt Co., 315 Fourth Ave., New York, N. Y.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

**FERRULES**
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.

**FIBRE BOARD PRODUCTS (Solid and Corrugated)**
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**FIBER CANDLES.** See Candles, Fixture.
**FIBRE GEARS.** See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

## FIBRE, Phenol

Moisture Proof; Sheet, Rod, Tubes.
Alco. See American Insulator Corp.
Amerine. See American Insulator Corp.
Armite. See Spaulding Fibre Co.
Bakelite-Dilecto. See Continental Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Electrical Insulation Corp., 308 W. Washington, Chicago, Ill.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4626 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Synthane Corp. Oaks, Pa.
Texolite. See Electrical Insulation Corp.
Vul-Cot. See National Vulcanized Fibre Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

## FIBRE, Vulcanized

Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Box 970M, Wilmington, Del.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York. N. Y.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Lava Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington. Del.

**FIBRE WASHERS.** See Fibre.
**FIELD COILS.** See Coils, Finished.

## FILAMENTS, Incandescent Lamp

Cohn, Sigmund, 44 Gold, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Radio Products Corp., Steneck Trust Bldg., Hoboken, N. J
Suter & Nuetzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

## FILES, Commutator Slotting

Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.

**FISH PAPER.** See Cloth and Paper.
**FITTINGS, Fixture.** See Fixture Fittings.
**FIXTURE CANDLES.** See Candles, Fixture.
**FIXTURE CHAIN.** See Chain, Fixture.
**FIXTURE, Collars.** See Fixture Fittings.

## FIXTURE FITTINGS

| | KEY |
|---|---|
| Bowl Holders | See B |
| Brass Fittings | See B |
| Canopies | See B |
| Collars | See B |
| Crow Feet | See I |
| Finials (Brass, Glass and Porcelain) | See B |
| Hangers | See H |
| Hickies, Brass | See B |
| Hickies, Iron | See I |
| Hooks, Brass | See B |
| Hooks, Iron | See I |
| Iron Fittings | See I |
| Loops, Brass | See B |
| Loops, Iron | See I |
| Rings | See B |
| Shade Holders | See S |
| Shells | See B |
| Spinnings | See B |
| Stampings | See B |
| Stems | See B |
| Straps | See H |
| Studs | See I |

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ..... H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) ..... B
American Ring Co., Waterbury, Conn. (Candle.) ..... S
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ..... B I
Arco. See American Ring Co.
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn ..... S
Artoloid. See Great Eastern Brass Wks., Inc.
Art Metal Co., 3721 Dayton, Cleveland, O. ..... H
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit.. B
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 83 Walker, New York ..... B
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ..... B I
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ..... B I H
Cambridge Brass Co., Cambridge, Mass. ..... B
Chase Brass & Copper Co., Waterbury, Conn. B S
Chatham Metal Spinning & Stamping Corp., 128 Mott, New York, N. Y. ..... B I
Cleanexy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ..... B S
Crescent Brass Mfg. Co., Reading, Pa. ..... B
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ..... S B
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) ..... I
Dunlap Co., John, Carnegie, Pa. ..... S
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. ..... B
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y. ..... S
F-Z Tip. See Plume & Atwood Mfg. Co.
Farley Mfg. Co., Decatur, Ill. ..... B I S H
Fixturelite Mfg. Co., 468 W. Broadway, New York, N. Y. ..... B H
Flaherty Co., M. E., 28 S. Clinton, Chicago. ..... I
Fralick Co., S. R., 15 S. Clinton, Chicago. ..... I



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Franklin Brass Foundry Co., Reading, Pa. ..... B
Friedley-Voshardt Co., Chicago. ..... B
Grabler Mfg. Co., 8365 Broadway, S. E., Cleveland, O. ..... I
Great Eastern Brass Wks., Inc., 182 Grand, New York, N. Y. (Spindles).
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec Co Hartford, Conn. ..... S
Isco. See Fixturelite Mfg. Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Liberty Brass Turning Co., 88 Walker, New York, N. Y. ..... I
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ..... B I
Liberty Machine Co., Wauwatosa, Wis. ..... B I
Light Metal Stamping Co., 310 13th St., West New York, N. J. ..... S
L & E Mfg. Co. 440 Adelphi, Brooklyn, N. Y. ..... H
L. & W. Brass Wks., 361 W. Superior, Chicago. B
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. ..... I
Metal Products Co., 210 Canal, New York. ..... B
Metro Iron Ornament Co., 191 Christie, New York, N. Y. ..... I
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ..... B
Midwest Elec. Co., 1639 Walnut, Chicago, Ill.. I
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. ..... B
Mitchell-Vance Co., 70 Washington, Brooklyn, N. Y. ..... S
Monarch. See Perfecilite Co.
Murlin Mfg. Co., Philadelphia, Pa. ..... B I
National Electric Products Corp., Pittsburgh, Pa. (Studs.) ..... I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. ..... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. ..... B
Noboit. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. ..... I
Onli. See Perfecilite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B S
Perfecilite Co., 1457 E. 40th, Cleveland. ..... S
Pittsburgh Valve & Fittings Co., Barberton, O. ..... I
Plume & Atwood Mfg. Co., Waterbury, Conn. B S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Products Machine Co., Bridgeport, Conn. ..... B
Reading Brass Co., 141 Schiller, Reading, Pa. B I
Ribaysen Mfg. Co., J., 952 W. Lake, Chicago, Ill. B
Rodale Mfg. Co., 200 Hudson, New York. ..... B H
Sandow Tool Co., 1440 Bway, New York, N. Y. ..... S
Scovill Mfg. Co., Waterbury, Conn. ..... B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ..... B
Star. See Perfecilite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. ..... I
Steele & Johnson Mfg. Co., Waterbury, Conn. B S
Stembridge & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ..... B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. ..... I
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & E Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ..... B
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ..... B
Walden Tool & Metal Mfg. Co., New Haven Conn.
Wameco. See Waterbury Metal Wares Co.
Waterbury Metal Wares Co., Waterbury, Conn. ..... S
Weber Brass Co., Whitney Power Block, Cleveland, O ..... B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 79 Madison Ave., New York, N. Y. ..... B S
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. ..... B

## FLASHERS, Sign

Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 280 Guttenberg, San Francisco
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Consolidated Elec. Sign Corp., Opalume Div., 99 West Main, Battle Creek, Mich.
Cramblett Engineering Div. of Time-O-Stat Controls Co. 286 Milwaukee, Milwaukee, Wis.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electric Signal Corp., 406 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Harrington-Seaberg Corp., 1708 Third Ave., Moline, Ill.
Horni Signal Mfg. Co., 516 Greenwich, New York, N. Y.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark See Betts & Betts Corp.
Kontroler. See Leland Electric Co.
Leland Electric Co., Dayton, O.
Mercury. See Betts, Inc., James H.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Siedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

**FLASHLIGHT LENSES.** See Lenses.
**FLEXIBLE ARMS.** See Tubing, Flexible Metallic.
**FLEXIBLE LEADS, Commutator Brush.** See Brushes, Commutator.

## FLEXIBLE SHAFTING

Binghamton Flexible Shaft Co., 239 Water, Binghamton, N. Y.
Chicago Flexible Shaft Co., 5600 W. Roosevelt Rd., Chicago, Ill.
Haskins Co., R. G., 4636 W. Fulton, Chicago, Ill.
Stow Mfg. Co., 443 State, Binghamton, N. Y.
Strand & Co., N. A., 500 N. Lincoln, Chicago, Ill.

**FOIL, Tin.** See Tin Foil.

## FORGINGS, Non-Ferrous

Scovill Mfg. Co., Waterbury, Conn.

## FORMS, Coil Winding

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

## FORMS, Wire

Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
City Wire Frame Co., 2025 S. Michigan Ave., Chicago.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Kricher's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Manhattan Wire Products Co., 398 First Ave., New York.
Mattetuck Mfg. Co., Waterbury, Conn.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

**FRAMES, Wire.** See Forms, Wire.
**FRICTION TAPE.** See Tape, Rubber and Friction.
**FRINGE, Chandelier.** See Crystals, Chandelier.

## FUSE CLIPS

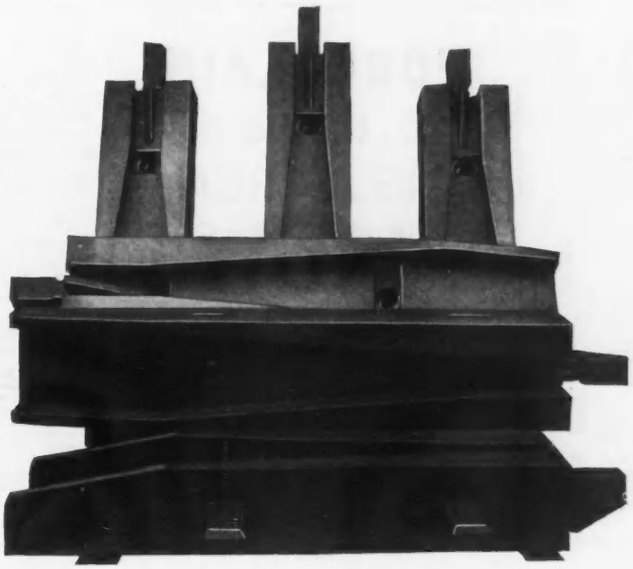
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.

**FUSE PLUG SCREW SHELLS.** See Shells, Screw Socket.
**FUSE TESTERS.** See Testers, Fuse and Circuit.

## FUSES AND FUSE WIRE

| | KEY |
|---|---|
| Cartridge | See C |
| Plug | See P |
| Non-Refillable | See N |
| Refillable | See R |
| Open Link | See O |
| Fuse Wire | See O |

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... P
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa. ..... O
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... P N
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. ..... P
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
Chase-Shawmut Co., Newburyport, Mass... C P N R O
Clearite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C N R
Commercial Enclosed Fuse Co., 1317 Willow Ave., Hoboken, N. J. ..... C P N
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P R
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ..... C R
Graybar Electric Co. See Graybar Electric Co.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y. ..... P
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va.. C P N R
Elliott Electric Co., Shreveport, La. ..... R
Gem. See Jefferson Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... C P N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C
Great Western Fuse Co 415 Lexington Ave., New York, N. Y. ..... R
H. & H. See Hart & Hegeman.



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**FUSES & FUSE WIRE**—Continued

Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn..... P . . B . .
Hudson Wire Co., Ossining, N. Y..... O
Jefferson Electric Co., 1505 W. 15th, Chicago, Ill..... C P N R O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y..... C P N . . O
Littelfuse Laboratories, 1773 Wilson Ave., Chicago, Ill. (Low Capacity, Glass Enclosed, .025 to 2 Amp.)..... .
Monarch Fuse Co., 116 E. First, Jamestown, N. Y. ..... C . . N B .
National. See Economy Fuse & Mfg. Co.
Neark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y ..... C P . . B . .
Platt Bros. & Co., Waterbury, Conn..... O
Powell, F. W., 119 W. Ohio, Pittsburgh.. . . P . . B . .
Ree-Nu-It Elec. Co., New Bedford, Mass.. C P . . B . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y..... C . . . B . .
Royal Elec. Co., Chelsea Station, Boston.. . . P N . . . .
Seco. See U. S. Electric Co.
Shawmut. See Chase-Shawmut Co.
Simplicity. See Cote Bros. Mfg. Co.
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . B . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N B .
Union. See Jefferson Elec. Co.
U.S. Electric Co., 20 Chambers, Trenton, N.J.... P . . . . .

## GALVANIZING

Cattle & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

**GALVANOMETERS.. See Instruments, Laboratory Standard.**

## GAS, Inert

Helium Co., Louisville, Ky.
Palstine Industrial Co., 111 Fifth Ave., New York, N. Y.
Weber, Alfred, 5 Union Square, New York, N. Y.

**GAS SIGN ELECTRODES. See Electrodes for Gas Signs**

## GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

**GAUZE BRUSHES, Wire. See Brushes, Commutator.**

**GEARS, Fibre. See Gears and Pinions, Composition.**

## GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
Cullman Wheel Co., 1346 Altgild, Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Violean, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Jones Fdy & Machine Co. W. A., Chicago, Ill.
Lewellen Mfg. Co., Columbus, Ind.
Lipe, W. C., Syracuse, N. Y.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.
Smith Winfield H., Springville, N. Y.

## GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

## GEARS AND PINIONS, Composition

Continental-Diamond Fibre Co., Bridgeport, Pa
Delaware Hard Fibre Co., Box 970M Wilmington, Del
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co. Wilmington, Del.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa

## GEARS AND PINIONS, Iron and Steel

Chicago Stock Gear Wks., 769 W. Jackson Blvd., Chicago
Earle Gear & Machine Co., Wayne Junction, Philadelphia
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg Co., 944 Dorchester Ave. Boston, Mass
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permax. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

## GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago. Ill
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

**GENERATORS. Electroplating. See Plating Generators**

**GLASS BULBS. See Bulbs. Glass.**

**GLASS CANDLES. See Candles, Fixture.**

**GLASS LETTERS. See Letters, Sign.**

## GLASS for Electrical Purposes

Canton Glass Co., Marion, Ind.
Corning Glass Wks., Cornine, N. Y.
Pyrex. See Corning Glass Wks.

## GLASSWARE

Atlas Glass & Mirror Co., 2315 Ogden Ave., Chicago, Ill.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y. "Equalite."
Beaumont Co., Morgantown, W. Va.
Bienenfeld Glass Wks., Inc., 1539 Covert, Brooklyn, N. Y.
Chesler & Sons, J., 45 Varick Ave., Brooklyn, N. Y.
Consolidated Lamp & Glass Co., Coraopolis, Pa. "Ameilte," "Aurora," "Cora," "Nulite," "Pastelle," "Rosedora," "Shade-O-Tone."
Corning Glass Co., Corning, N. Y. "Aurene," "Calcite."
Eagle Mfg. Co., Wellsburg, W. Va.
Forger & Co., A. H., 2414 E. 58th, Los Angeles, Cal.
Gill Glass Div. of Gill-Virden Co., Amber & Venango Sts., Philadelphia, Pa. "Alligiass," "Gilligio," "Gillway," "Hyperion," "Nova," "Una," "Utilitilite," "Velva."



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Gillinder & Sons, Inc., Philadelphia, Pa. "Glassilk," "Persian," "Mellilte," "Micro."
Glass & Mfg. Co., Wellsburg, W. Va.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y. "Alabaster," "Amazon," "Blanco," "Carmia," "Carrara," "Celestialite," "Florentine," "Gletian," "Gletieco," "Opalux," "Polycase," "Silverglow."
Hocking Glass Co., Lancaster, O. "Lumina."
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O. "Nuart."
Inland Glass Wks., Inc., 6101 W. 65th, Chicago, Ill. "Snow White," "Inilte," "Alabaster," "Cased," "Crackled," "Etched."
Ivanhoe Division of Miller Co., Cleveland, O. "Clearcut," "Druid," "Genco," "Ivre," "Reglut," "Rozelle," "Sudan," "Trejan," "Veluria," "Yural."
Jeannette Shade & Novelty Co., Jeannette, Pa. "Ardmore," "Tensolite."
Jefferson Glass Co., Follansbee, W. Va. "Moonstone," "Nitro-Glass."
Kopp Glass, Inc., Swissvale, Pa. "Havana," "Nicco," "Delica White."
Macbeth-Evans Glass Co., Charlerol, Pa. "Alba," "Cremax," "Monax," "Thebian," "Lumite," "Galax."
McFaddin & Co., H. G., 38 Warren, New York, N. Y. "Bellova," "Emeralite."
Perfection Glass Co., Star City, W. Va. "Oplex."
Phoenix Glass Co., Monaca, Pa. "Ivory," "Magnolia," "Radiant."
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y. "Berylite."
Rawson & Evans Co., 710 Washington Blvd., Chicago, Ill.
Star Glass Co., Star City, W. Va.
Steimer, Doran & Rowe, 336 Fourth Ave., Pittsburgh, Pa. "Radax."
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Wells Glass Co., Kokomo, Ind. "Daylite."
Williamsburg Flint Glass Co., 290 Broadway, New York.
Zanesville Mould Co., Zanesville, O.

## GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.

**GRAPHITE BEARINGS. See Bearings, Oil-less.**

**GRID LEAKS. See Radio Circuit Components.**

**GRIDS, Resistance. See Units, Rods and Grids.**

**GRILL CLOTH. See Cloth, Untreated.**

**GRINDERS, Commutator. See Tools, Commutator Truing.**

**GROMMETS. See Eyelets.**

**GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.**

**GROWLERS. Armature. See Testers, Coil.**

## HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Strombeck-Becker Mfg. Co., Moline, Ill.
Sun Enamel Wks., Leominster, Mass.

## HEATERS, Industrial

Beckwith Machine Co., 402 Chestnut, Ravenna, O.

**HOLDERS, Brush. See Brushes, Commutator.**

**HOT WIRE METERS. See Instruments, Portable and Switchboard.**

**IMPREGNATING COMPOUNDS. See Wax and Compounds**
**IMPREGNATING, VACUUM. See Ovens, Industrial.**
**INCANDESCENT LAMP BULBS (Unfinished). See Bulbs Glass.**
**INCANDESCENT LAMP FILAMENTS. See Filaments Incandescent Lamp.**

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Operation and Cost Indicators for Manager's Office.
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Elinco. See Electric Indicator Corp.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill

**INDUCTION COILS. See Coils, Finished.**
**INSTRUMENT, Jewels. See Jewels.**
**INSTRUMENTS, Laboratory Standard. See Instruments Laboratory Standard.**
**INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard: also Instruments, Pocket.**

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Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 127 Michigan Ave., Pasadena, Cal. (Osculloscope.)
Cambridge Instrument Co., Grand Central Terminal Bldg., New York, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill
Delta-Star Elec. Co., 2437 Fulton, Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy. See Rubicon Co.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Hiscok Elec'l Instrument Co., 10614 Dupont, Cleveland, O
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Milvay. See Chicago Apparatus Co.
Oaiac. See Westinghouse Electric & Mfg. Co.
Rawson Eleg'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y
Rubicon Co., 29 N. Sixth, Philadelphia Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
Simplex. See Leeds & Northrup Co.
Strobatchy. See Argco Laboratories, Inc.
Stromberg Electric Co., 233 W. Erie, Chicago, Ill.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 583 Freilinghuysen Ave. Newark, N. J.

## INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., 927 French, Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Heyer Products Co., 197 Grove, Bloomfield, N. J.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Weston Elecl. Instrument Corp., 583 Freilinghuysen Ave. Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

## INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Argco Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., Penacook, N. H.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Donegan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Ground-Ohmer. See Sticht & Co.
Handy. See Weinberg & Co.
Heyer Products Co., 197 Grove, Bloomfield, N. J.
Hiekok Elecl. Inst. Co., 10614 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
I T L. See Illinois Testing Laboratories.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Pin-Jack. See Weston Elec'l Instrument Co.
Price Hollister Co., Rockford, Ill.
Queen. See Gray Instrument Co.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co. 239 Broadway, New York, N. Y
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standco. See Sticht Co., H. H.
Stanley Co., Hartford, Conn.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Sticht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 583 Freilinghuysen Ave., Newark, N. J.

## INSULATION (Insulating) (Insulators)

Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
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Paper. See Cloth and Paper Insulating.
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**Soapstone.** See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

**INSULATING MACHINES, WIRE.** See Wire Manufacturing Machines.

**INSULATING TUBING.** See Tubing, Varnished Fabric; also Tubing, Rubber.

## INSULATION CUTTERS

**Artos Engrg. Co.,** 115 Brown, Milwaukee, Wis.

## INSULATION MIXERS

**Baker Perkins Co.,** Saginaw, Mich.

**INSULATION SHEARS.** See Shears, Insulation.

**INSULATION STRAINING MACHINES.** See Wire Manufacturing Machines.

**INSULATION TESTERS.** See Instruments, Laboratory Standard.

## INSULATORS, Canopy

Continental-Diamond Fibre Co., Bridgeport, Pa.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
**Macallen Co.,** Boston 27, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

**IRON CASTINGS.** See Castings, Gray Iron.

**IRONS, Soldering.** See Soldering Irons.

**JACKS, Armature.** See Lifts, Armature.

**JACKS, Radio.** See Radio Receiver Parts.

## JARS, Battery, Glass

For Composition Jars. See Molded Insulation; also Rubber.
Corning Glass Co., Corning, N. Y.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Rodefer Glass Co., Bellaire, O
Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa

## JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa
**Fisher, Thomas E.,** Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave. Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y
Universal. See Oeffinger, J. L.
**Wennstrom's Sons Co., John, Suffern, N. Y.**
**Worley Jewel Co., John, Waltham, Mass.**

## JOINTS, Fixture Insulating

**Appleton Elec. Co., 1703 Wellington Ave., Chicago,** Ill.
Macallen Co., Boston 27, Mass.
**Sandow Tool Co., 1440 Broadway, New York, N. Y.**
**Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.**
White Co., O. C., 15 Hermon, Worcester, Mass.
**Wittenberg Bros., 60 Shipman, Newark, N. J.**

## LABORATORY (Laboratories.)

Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

**LABORATORY STANDARD INSTRUMENTS.** See Instruments, Laboratory Standard.

**LACQUER, ARMATURE.** See Paint, Varnish and Lacquer.
Metal. See Paint, Varnish and Lacquer.

**LAMINATIONS.** See Discs, Armature.

**LAMP BASES.** See Bases, Reading Lamp.

**LAMP BULBS (Unfinished).** See Bulbs, Glass.

**LAMP FILAMENTS.** See Filaments, Incandescent Lamp.

**LAMP LEAD-IN WELDS.** See Filaments, Incandescent Lamp.

**LAMP TESTING PHOTOMETERS.** See Photometers, Lamp.

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**Allen Electric & Equipment Co., Kalamazoo, Michigan**
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
**Hobart Bros. Company, Troy, Ohio. (Test Bench).**
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

**LAVA.** See Cores, Resistance Coil.

## LEAD

American Lead Co., 3112 Penn Ave., Pittsburgh, Pa.
Blatchford Co., E. W., 608 Dearborn, Chicago, Ill.
Columbia Smelting & Refining Wks., 365 West, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago, Ill.
Federated Metals Corp., Woolworth Bldg., New York, N. Y.
Jacobson & Son Co., I. M., 15304 Idaho, Detroit, Mich.
National Lead Co., 111 Broadway, New York, N. Y.
Raymond Lead Co., 735 S. Washtenaw Ave., Chicago, Ill.
Turner Lead Co., East St. Louis, Ill.
United Metals Selling Co., 25 Broadway, New York, N. Y.

**LEAD-IN WELDS, Lamp.** See Filaments, Incandescent Lamp.

**LEADS, FLEXIBLE** (Commutator Brush). See Brushes.

## LENSES

Sign Letter, Flashlight, Projector and Reflector Lenses Also glass caps, jewels and bezels for all electrical devices See also Jewels, Instrument Bearing.



**Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y.** (Condensing and Projection Lenses.)
**B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.**
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Electric Power Equipment Corp., 412 W. 18th, Philadelphia, Pa.
Elpeco. See Electric Power Equipment Corp.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Lig. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Light Corp., 30 W. 15th, New York, N. Y.
Popper & Sons, Leo, 147 Franklin, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rochester Glass Products, Inc., 29 N. Water, Rochester, N. Y.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

## LETTERS, Sign

Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3954 Cooper Ave., Cleveland, O. (Brass and White Metal.)
**Chicago Miniature Lamp Co., 654 W. Lake, Chicago, Ill.** (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs, Inc., 2736 Wentworth Ave., Chicago, Ill.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York, N. Y. (For Gas Signs.)
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

## LIFTS, Armature

Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave & Chestnut St., Brooklyn, N. Y.
Duff-Norton Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

## LININGS, Socket

Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn

**LOCK WASHERS.** See Washers, Lock.

**LOOP WINDERS & SPREADERS.** See Winding Machines, Armature & Field Coil.

**LOUD SPEAKER DIAPHRAGMS MATERIAL.** See Cloth, Untreated; also Parchment Paper.

## LOUD SPEAKERS

Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Amervox. See American Reproducer Co.
American Radio Products Corp., 149 Broadway, New York.
American Reproducers Co., 1204 Summit Ave., Jersey City N. J.
A. R. C. See American Reproducers Co.
Amplion. See Woolf, J. W. & W. L.
Raritone Mfg. Co., 846 Jackson Blvd., Chicago, Ill.
Boudette Mfg. Co., Chelsea, Mass.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Conamic. See Operadio Mfg. Co.
Decatur Mfg. Co., 45 Harman St., Brooklyn, N. Y.
Dreher & Son, Chas., 157 Spring, New York, N. Y.
Duo-Lae. See F. & H. Radio Laboratories.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 12nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fidelity Radio Corp., Salt Lake City, Utah.
F. & H. Radio Laboratories, Fargo, N. D.
Globe Technolian Corp., Reading, Mass.
G. R. P. See Penn Mfg. Co.
Grutsl Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jack Horner. See Operadio Mfg. Co.
Jensen Radio Mfg. Co., 6601 S. Lavanie Ave., Chicago, Ill.
Kersten Radio Equipment, Inc., 1415 Filliford, Kalamazoo, Mich.
Kyle. See Newcombe-Hawley.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Mandel Electric Co., 2157 N. California Ave., Chicago, Ill.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Corp., 31 W. 21st, New York, N. Y.
Minuet. See Thompson Radio Co.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Operadio Mfg. Co., St. Charles, Ill.
Peerless. See United Reproducers Corp.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powerola. See Temple Corp.
Puronower. See Platter Cabinet Co.
Quam Radio Products Co., Div. of United Air Cleaner Corp., 9705 Cottage Grove Ave., Chicago, Ill.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)



Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Swedola Co., Maritime Bldg., Seattle, Wash.
Thompson Radio Co., 25 Church, New York, N. Y.
**Ultratone Mfg. Co., 1046 W. Van Buren, Chicago, Ill.**
**Universal.** High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
**Utah Radio Products Co., 1615 S. Michigan Ave., Chicago,** Ill. (Also Piano Unit.)
Utona. See American Radio Products Corp.
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Wonderphone. See Universal High-Power Telephone Co.
Woolf, J. W. & W. L., 133 W. 21st, New York, N. Y.
Wright-De Coster, Inc., St. Paul, Minn.

## LUGS, Copper

Anderson Mfg. Co., Albert & J. M., 239 A St., Boston
Dante Elect. Mfg. Co., Bantam, Conn.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
**Sherman Mfg. Co., H. B., Battle Creek, Mich.**
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

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KEY
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Pendants (Bulbs) .....See P
Standard Parts .....See S

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**Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.**..... S P
**Bryant Electric Co., Bridgeport, Conn.**..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis
Eaglelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y..... P
General Elec. Co., Merchandise Dept., Bridgeport, Conn..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
**Hart & Hegeman, Div. of Arrow-Hart & Hegeman Electric Co., Hartford, Conn.**..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C P
Reynolds Spring Co., Jackson, Mich..... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia.. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y..... C S P

**MACHINE SCREWS.** See Screws, Machine.

**MACHINE SCREW PRODUCTS.** See Screw Machine Products.

## MACHINES

**Armature Banding.** See Banding Machines, Armature
Armature Notching. See Notching Machines, Armature
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters
**Engraving.** See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

## MACHINES, Lamp Making

For Making Incandescent Lamps and Vacuum Tubes.
Argco Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass
(Vacuum Pumps.)
Czerwenka, Frank, 35 Monroe, Passaic, N. J. (Bombarding Machines.)
Eisler Electric Corp., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York N. Y. (Filament Winder.)
Gesco. See General Engineering & Supply Co
Rhason Mfg. Co., 124 45th, Union City, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

**MACHINES, Bombarding.** See Machines, Lamp Making.
**MACHINES, Pleating and Fluting.** See Pleating Machines.
**MACHINES, Spring Making.** See Spring Making Machines
**MACHINES, WIRE MANUFACTURING.** See Wire Manufacturing Machines.

**MAGNET CHARGERS.** See Chargers, Magnet.

**MAGNET STEEL.** See Steel, Magnet.

**MAGNET TESTERS.** See Instruments, Portable and Switchboard; also Instruments, Pocket.

**MAGNET WIRE MACHINES.** See Enameling Machines for Magnet Wire.

**MAGNETIC CHUCKS.** See Chucks, Magnetic.

**MAGNETIC CLUTCHES.** See Clutches, Magnetic.

**MAGNETOMETERS.** See Instruments, Pocket.




# "STANDARDIZING" Special Motors

**Sounds like a paradox. But it has been done**

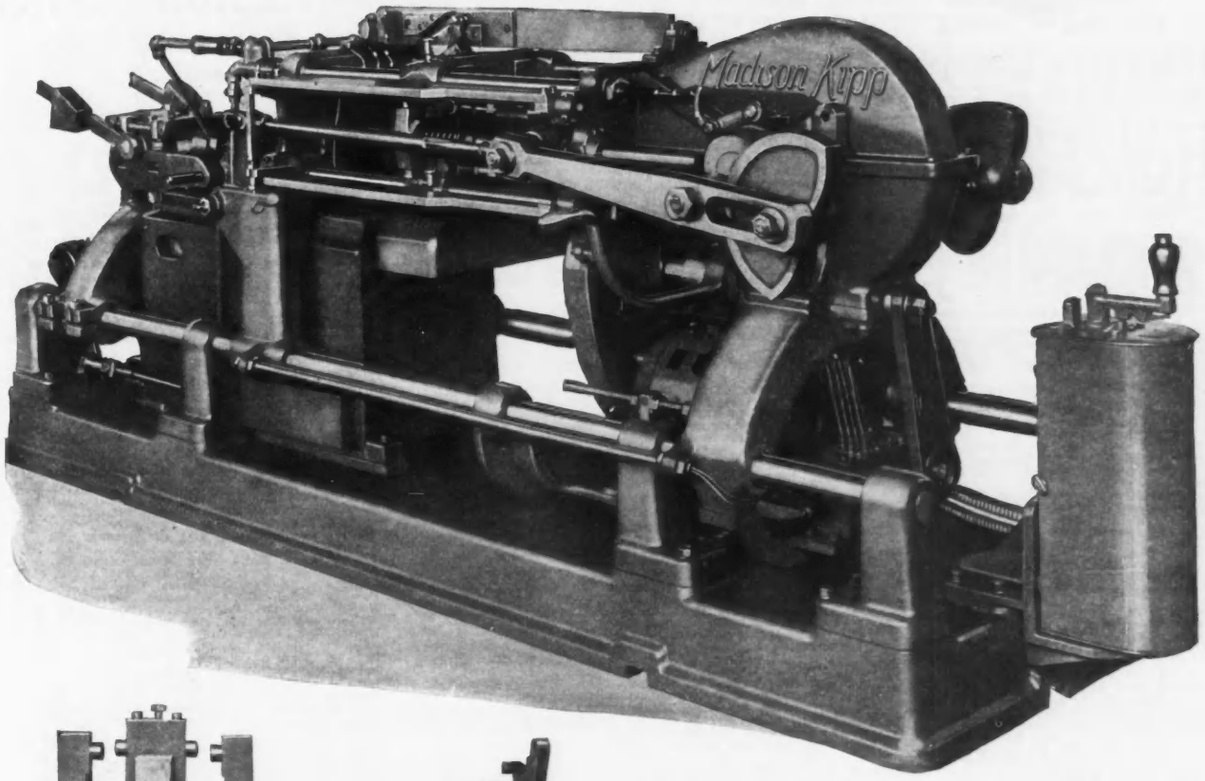
**By James S. Knowlson**

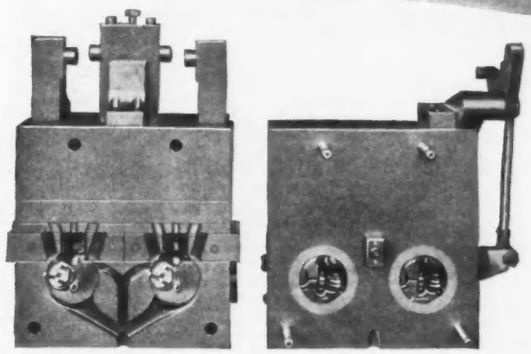
**General Manager, Speedway Manufacturing Company**

**as you will see by turning to the article on page 22**

# Simplifying Die Mechanism

## for the casting of complicated parts



A two cavity die casting die designed and built by the Madison-Kipp Die Casting Division showing the simplified mechanism of a Madison-Kipp Die for the casting of a complicated part

THE possibilities of simplifying the die mechanism for the casting of complicated parts on the Madison-Kipp Die Casting Machine are strikingly illustrated in the photographs above.

Because the Madison-Kipp is a fully automatic machine, movements can be combined within the die and the mechanism for complicated dies accordingly greatly reduced.

Simplified die mechanism is only one of the features of the Madison-Kipp Die Casting Machine that lead to increased production of die cast parts. With the Madison-Kipp, die casting production is on a machine tool basis, with the same economy, accuracy and high speed production that distinguish modern machine tool operation.

We will gladly send full information to any operating official, plant engineer or executive.

**Madison-Kipp** CORPORATION

*Madison, Wisconsin, U.S.A.*

211 Waubesa St.

**DIE CASTING MACHINES**

**BAKELITE MOULDERS**

SHAW

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**Insulator Company**

IRVINGTON, NEWARK, NEW JERSEY


## MAGNETS, Permanent

Bulleas Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chica.
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.

## MALLETS, Raw Hide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Cradle Pelt. See Chicago Rawhide Mfg. Co.
Holbrook Raw Hide Mfg. Co., 748 N. Main, Providence, R. I.

MANGANESE, Battery. See Chemicals, Battery.

## MARKERS AND STAMPERS, Metal

Schmidt, Inc., Geo. T., 4102 Ravenswood Ave., Chicago, Ill.

MEASURING INSTRUMENTS. See Instruments.
METAL CUTTING OUTFITS. See Welding and Cutting
MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.
MEGOHMMETERS. See Instruments. Laboratory Standard

## MELTING POTS AND LADLES, SOLDER, ETC.

Dunco. See Struthers Dunn, Inc.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.

MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
Outfits.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools.
Commutator.

## MICA

Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 533 Canal, New York, N. Y.
Hirsch Mica Co 1087 Flushing Ave., Brooklyn, N. Y.
Hoyt, Inc., Philip S., Los Tablos, New Mexico.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3060 Brandywine, Philadelphia, Pa
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Boston 27, Mass.
Micabond. See Chicago Mica Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Mica Products Mfg. Co., 54 Greene, New York, N. Y.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 957 Monadnock Blk., Chicago
(Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pratt Shellac Co., 81 Water St., New York. (Imp
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Sterra Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.
MIXERS, INSULATION. See Insulation Mixers.

## MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.
Shades. See Molded Insulation.

## MOLDED INSULATION

Aico. See American Insulator Corp.
Allen & Hills, Inc., Auburn, N. Y.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa. (Cold.)
Amberoid. See Ambler Asbestos Shingle & Sheathing Co.
American Insulator Corp., New Freedom, Pa.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N.
Amerite. See American Insulator Corp.
Auburn Button Wks., 48 Canoga, Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Beatsol Corp., 20 Littleton Ave., Newark, N. J.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Perkins, Boston, Mass. Radio Parts.
Bettle. See Synthetic Plastics Co., Inc.
Boonton Molding Co., 300 Myrtle Ave., Boonton, N. J.
Boonton Rubber Mfg Co., 223 Fanny Rd., Boonton, N. J.
Brewlite Moulding Corp., 109 Hudson, Jersey City, N. J
(Wood Composition.)
Celluloid Corp., 10 E. 40th, New York, N. Y.
Cepco. See Monowatt Corp.
Celec. See Monowatt Corp.
Celedite. See Monowatt Corp.
Celtrock. See Colt's Patent Firearms Mfg. Co.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.



Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Cutler-Hammer, Inc., 1250 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimec. See Dayton Insulating Moulding Co.
Duros. See General Plastics, Inc.
Electrical Insulation Corp., 308 W. Washington, Chicago, Ill.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Everwood. See Bakelite Corp.
Formica Insulation Co., 4626 Spring Grove Ave., Cincin-
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 29 E. Walck Rd., N. Tonawanda, N. Y.
Grotelite Co., Grandview & Lafayette Aves., Bellvue, Ky
Grummor. See Garfield Mfg. Co.
Hann Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Herculite. See Celesta Co.
Hi-Heat. See Insulation Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Imptoco. See Insulation Products Co.
India. See American Machine & Foundry Co.
Insulation Mfg. Co., New York Ave. and Herkimer St. Brooklyn, N. Y.
Insulation Products Co., Richland, Pittsburgh, Pa.
Insuline Corp. of America 78 Cortlandt, New York, N. Y
International Insulating, Division of General Industries Co., Syria, Ohio.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Luco Products Corp., 40 Flatbush Ave. Extension, Brooklyn, N. Y.
Lumarith. See Celluloid Corp.
Luxite. See Wilbur & Williams Co.
Macallen Co., Boston, 27, Mass.
Mack Molding Co., Wayne, N. J.
Makalot. See Johnson Molding & Tool Co.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Mico. See Molded Insulation Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
Molded Insulation Co., Mt. Vernon, N. Y.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
New England Products Co., 232 Greenwich, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norice. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., Div. 82, Lockport, N. Y.
Panelyte Corp., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Plastic Molding Corp., Sandy Hook, Conn. (Cold.)
Plymouth Mfg. Co., 2148 Walnut, Chicago, Ill.
Pollopas. See Wilbur & Williams.
Pruvenite Compositions Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyroloc. See Cutler-Hammer Mfg. Co.
Racio Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes Rubber Co., Jos., Trenton, N. J.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synthetic Plastic Co., Inc., 535 Fifth Ave., New York, N. Y. (Molding Powder).
Textolite. See General Elec. Co., also Electrical Insulation Corp.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y
Waterbury Button & Moulding Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Wilbur & Williams Co., 261 Park Square Bldg., Boston, Mass. (Molding Powder.)

## MOLYBDENUM

American Electro Metal Corp., 65 Madison Ave., New York, N. Y.
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire Co., 255 Sherman Ave., Newark, N. J.

## MONEL METAL

International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

## MOTORS

Alternating Current ..... See S
Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U

Actodector. See Roth Bros. Co., Div. of Century Electric Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis.... M .. S ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. S ..
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago..... .. F S U
Bogue Elec. Co., Chas. J.. 152 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F .. ..




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Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & B Mfg. Co., 812 Lafayette, Toledo, O..... .. F .. ..
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeysson Elec. Co., St. Louis, Mo..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Continental Elec. Co., 14 Magazine, Newark.. M .. S ..
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord N. H..... M F S ..
Diehl Mfg. Co., Elizabeth, N. J..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., Kent, O..... .. .. S U
Dumore Co., 35 16th, Racine, Wis..... .. F .. U
Eclipse. See Fidelity Elec. Co.
Edco. See Electro Dynamic Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1735 Clarkstone Rd., Cleveland, O. ..... .. .. .. ..
Electric Specialty Co., 231 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J..... M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo..... M F S U
Enco. See Electric Specialty Co.
Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago, Ill. ..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn..... .. F .. ..
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. ..... .. F .. S ..
General Motors Radio Corp., Miami Chapel Rd. & Wisconsin Blvd., Dayton, O..... .. F S ..
Gilbert Co., A. C., New Haven, Conn..... .. F .. U
Hamilton Beach Mfg. Co., Racine, Wis..... .. F S U
Hobart Bros. Co., Troy, O..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F .. ..
Howell Elec. Motors Co., Howell, Mich..... M F S ..
Ideal Elec. & Mfg. Co., Mansfield, O..... .. .. S ..
Imperial Electric Co., Akron, O..... M .. S ..
Janette Mfg. Co., 551 W. Monroe, Chicago..... .. F S ..
Jants & Leigt Elec. Co., Cincinnati, O..... M F .. ..
Kendrick & Davis Co., Lebanon, N. H..... .. F S ..
Kimble Elec. Co., 654 N. Western Ave., Chicago M .. S U
Knapp Elec., Inc., Portchester, N. Y..... .. F S U
Leland Elec. Co., Dayton, O..... .. F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O..... M .. .. ..
Mando Co., 911 State Tower Bldg., Syracuse, N. Y. (6-12-40 Volt only)..... .. F .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich..... M .. .. ..
Master Electric Co., Dayton, O..... M F S ..
MC. See General Electric Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk See Walter Elec. Mfg. Co.
North East Appliance Corp., Rochester, N. Y. .. F .. U
Northwestern Mfg. Co., 480 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio ..... .. F S ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland. ..... M .. S ..
Reynolds Electric Co., 2850 W. Congress, Chicago .. F S ..
Robbins & Myers, Inc., Springfield, O..... M F S U
Roth Bros. & Co., Div. of Century Elec. Co., 1400 W. Adams, Chicago, Ill. ..... M F S ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y..... M F S U
Sturtevant Co., 15 Devonshire (Hyde Park), Boston, Mass. ..... M F S U
Sunlight Electrical Mfg. Co., Warren, O..... .. F S ..
Suner Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Troy Engine & Machine Co., Engberg's Div., St. Joseph, Mich. ..... M .. S ..
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. ..... M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M .. S ..
Watson. See Allis Co. Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., 1522 Central Parkway, Cincinnati, O. ..... M .. S ..
Woods Mach. Co., S. A., Boston..... M F S ..
Zobell Elec. Motor Co., Garwood, N. J..... M .. S ..

## NAME PLATES

See also Decalcomania.

Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Chandler Co., Springfield, Mass.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Electro-Chemical Engraving Co., 52 Vanderbilt Ave., New York, N. Y.

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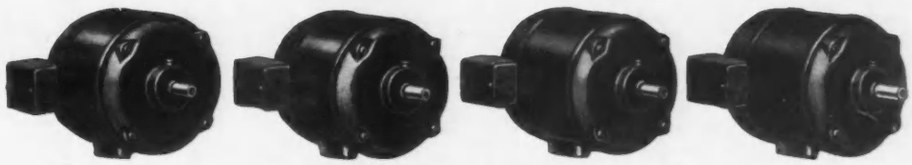

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DIALS AND SCALES
*RADIO ESCUTCHEONS AND METAL PANELS*
***General Etching & Mfg. Co.***
3072-82 W. Grand Ave. Chicago, Ill.


**NAME PLATES**—Continued
Etched Products Corp., 29 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
General Etching & Mfg. Co., 3070 W. Grand Ave., Chicago, Ill.
Grammes & Sons Inc., I. F., Allentown, Pa.
Mayer & Co., Geo. J., 36 S. Meridian, Indianapolis, Ind.
Mechanical Engraving Co., 130 Orchard, Newark, N. J.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Turner Brass Works, Sycamore, Ill.
Waterbury Button & Moulding Co., Waterbury, Conn.

**NICKEL**
American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.
Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Seymour Mfg. Co., Seymour, Conn.

**NOTCHING MACHINES, Armature**
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo, N. Y.

**NUT SETTING MACHINES**
Vim Electric Tool Co., 149 Broadway, New York, N. Y.

**OHMMETERS.** See Instruments, Laboratory Standard; also Instruments, Portable and Switchboard.

**OIL-LESS BEARINGS.** See Bearings, Oil-less.

**OSCILLOSCOPES.** See Instruments, Laboratory Standard.

**OVENS, Industrial and Laboratory**
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Buffalo Fdry. & Machine Co., 1543 Fillmore, Buffalo, N. Y. (Armature and Coil.)
Conran, Frederick M., 107 Colden, Newark, N. J.
Crawford Oven Co., New Haven, Conn. (Coil Driers.)
Despatch Oven Co., 622 Ninth, S. E., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Mfg. Co., J. P., Mount Vernon, Ill.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas Thermo Elec. Co., 1206 Grove, Irvington, N. J.
Gebnrich Indirect Heat Oven Co., Long Island City, N. Y.
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 408 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 186 Piedmont, Waterbury, Conn.
Lydon Bros., 299 Colden, Jersey City, N. J.
Maehler Co., Paul, 2220 West Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Sargent & Co., E. H., 155 E. Superior, Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., H. E., 197 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5834 Tabor Rd. (Oiney), Philadelphia.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thelco. See Freas Thermo Elec. Co.
Westinghouse Elec. & Mfg Co., Mansfield, O
Young Bros. Co., 6523 Mack Ave., Detroit, Mich.

**OXIDES, Battery.** See Chemicals, Battery.

**PACKING**
Cooke Seal Ring, Dept. W, 46 N. Green St., Chicago, Ill.
Federal Metallic Packing Co., Wakefield, Mass.
Holed-Tite Packing, Inc., 100 E. 42nd, New York, N. Y.
Packtite. See Federal Metallic Packing Co.

**PAINT, Varnish, Lacquer** KEY
Varnishes, Insulating ..... See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof..See P
Lacquer, Metal Finishing .....See L

Acme White Lead & Color Wks., 3250 St. Aubin Ave., Detroit, Mich. ..... L
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Dt-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. ..... V . . .
American Lastite Co., 2168 Lincoln Ave., Chicago.. . . P L
American Wurtzilite Co., Builders Bldg., Chicago .. P . .
Antakwa Co., 1329 Mohawk, Chicago, Ill..... P . .
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. . . . L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-Craft. See Southwestern Paint & Varnish Co.
Atlantic Chemical Co., Coit, Irvington, N. J..... . . . L
Atom Chemical Co 96 E. 16th, New York N. Y..... L
Ault & Wiborg Varnish Wks., 432 New, Cincinnati, O. ..... V . . .
Bakelite Corp., 247 Park Ave., New York, N. Y.. . . . L
Benolite Varnish Co., 501 Columbia Bank Bldg., Pittsburgh ..... V P . .
Berry Bros., Leib & Wight, Detroit, Mich..... V . . .
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V . . .
Biwax Corp., 208 S. La Salle, Chicago, Ill..... P . .




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Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P . .
Carboloid Products Corp., 13 Park Row, New York, V P . .
Chadeloid Chemical Co., 75 E 45th, New York. V . . .
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P . .
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeins, Columbus, O. V . . .
Comulac. See Martindale Elec. Co.
Continental-Diamond Fibre Co., Bridgeport, Pa. V . . .
Day & Co., James B., 1872 Clybourn Ave. Chicago, Ill. ..... P L
Doe & Co., Walter S., Kent, Ohio..... . . .
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P . .
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del.. . P . .
Durez. See General Plastics.
Eastman Kodak Co., Rochester, N. Y..... . . L
Eclipse Paint & Mfg. Co., Cleveland, O..... P . .
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York.. . . . L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O..... . . . L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O. ..... V P L
Fesco. See Ferbert-Schorndorfer Co.
Five Point. See American Wurtzilite Co.
Franche & Co., 440 Orleans, Chicago, Ill..... L
General Elec. Co., Dept. M-322, Bridgeport, Conn. V P . .
General Plastics, Inc., 19 E Walck Rd., N. Tonawanda, N. Y. ..... V . . .
George Co., P. D., 4153 Bingham Ave., St. Louis. V . . .
G. E. See General Elec. Co.
Glidden Co., Cleveland, O..... V P L
Glyptal. See General Electric Co., Schenectady.
H. B. See Maas & Waldstein Co.
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P . .
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lackerite. See Twin City Shellac Co., Inc.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O..... V P . .
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P . .
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. ..... L
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. ..... V . . .
Mawalac. See Maas & Waldstein.
Meeco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V . . .
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P . .
Nepto Lac. See Lowe Bros. Co.
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. . . . L
O'Brien Varnish Co., South Bend, Ind..... V P L
Ohmlac Refining Co., 140 S. Dearborn, Chicago, Ill. . . P . .
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co.
P & B See Ruberoid Co.
Pecora Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. ..... L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. . . . . L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. . . P L
Reliable Leather Dressing Co., 43 Crescent, Long Island City, N. Y. ..... V . . .
Republic Varnish Co., 200 Thomas, Newark, N. J. V . . .
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P . .
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y..... V P . .
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Standard Flexible Comp. Co., 1213 Franklin Trust Bldg., Philadelphia, Pa. ..... V P . .
Standard Insulation Co., Rutherford, N. J..... V . . .
Standard Lacquer Co., 621 Broadway, New York. . . . L
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P . .
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Hayrville, Pa. ..... V . . .
Toch Bros., 443 4th Ave., New York..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. ..... V . . .
Tuloc. See Mitchell-Rand Mfg. Co.
Twin City Shellac Co., Inc., 338 Flushing Ave., Brooklyn, N. Y. ..... V P L
Varflex Corp., Rome, N. Y..... V . . .
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P . .
Waipole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill..... . . . L
Walker Co., Henry V., 17 John St., New York.. . . . L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P . .
Zapon Co., Stamford, Conn..... . . . L
Zeliac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. . . . . L

**PANELS (panel) Engraving.** See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard.

**PAPER**
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Flah. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

**PARAFFINE.** See Wax and Compounds.

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De Jonge & Co., Louis, 69 Duane, New York, N. Y.
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Raquette River Paper Co., Potsdam, N. Y.
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Special Paper Mfg. Co., 96 Reade, New York, N. Y.
Strype, Fred C., 140 Lafayette, New York, N. Y.
Taylor-Logan Co., Holyoke, Mass.
Union Paper & Twine Co., 116 St. Clair Ave., N. W., Cleveland, O.
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Weber Co., F., 1220 Buttonwood, Philadelphia, Pa.
West Carrollton Parchment Co., West Carrollton, O.
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National Vulcanized Fibre Co., Wilmington, Del.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass
White Supply Co., 4347 Duncan, St. Louis, Mo.

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Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
Post Elec. Co., 7 E. 44th, New York, N. Y.
Stylectric. See Post Electric Co.

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Asam Bros., 917 Arch, Philadelphia, Pa.
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Capital Novelty Co., Lincoln, Neb.
Cummings Co., B. F., 4740 Ravenswood Park, Chicago, Ill
Hamilton Engrs. Products Co., Hamilton, Ohio (Music Rolls).

**PHENOLIC INSULATION.** See Fibre, Phenol. Also Molded Insulation

**PHOSPHOR BRONZE**
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Anaconda. See American Brass Co.
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Foto Cell. See National Carbon Co.
General Electric Co., Schenectady, N. Y.
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Kino-Lamp. See Raytheon Mfg. Co.
McWilliams. See Electric B-G Products Co.
National Carbon Co., New York, N. Y.
Photion Instrument Corp., 574 Southern Blvd., New York
Visitron. See G-M Laboratories, Inc.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio.

### PHOTOMETERS, Lamp Testing
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Foote, Pierson & Co., 75 Hudson, Newark, N. J.
Holophane Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Luxometer. See James G. Biddle
Mathews. See Foote, Pierson & Co.
National Lamp Wks., Cleveland, O.

**PICK-UPS, TALKING MACHINE.** See Loud Speakers.

**PIGTAILS, Commutator.** See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners.

**PINIONS.** See Gears and Pinions.

**PINION PULLERS.** See Pullers, Armature Shaft.

**PLASTICS.** See Molded Insulation.

**PLATES, Name.** See Name Plates; Also Decalcomanis
**Fixture Outlets.** See Fixture Fittings.
Storage Battery. See Plates, Storage Battery.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa

### PLATES, Storage Battery
Ace Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind
Buss Structure Co., Besse Bldg., Springfield, Mass. (Steel.)
Champion. See Englert Mfg. Co.
C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., 2500 Jane, Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Henrick, Inc., 555 W. 52nd St., New York, N. Y.
New Jersey Storage Battery Co., 656 Summit Ave., Union City, N. J.
Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
Witherbee Storage Battery Co., 75 Columbus Ave., New York.

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Burke Elec. Co., Erie, Pa.
Chanderson Elec. Co., St. Louis, Mo.
Columbia Elec. Mfg. Co., 1292 E. 53rd, Cleveland, Ohio
Connecticut Dynamoz Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., 522 Nevell, Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Speciality Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Electric & Mfg. Co., East Third St., Mansfield, O.
Jants & Leist Elec. Co., Cincinnati, O.
Kendrick & Davis Co., Lebanon, N. H.
L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave. Chicago, Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
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Bonderite. See Parker Rust-Proof Co.
Chromalite. See Metals Protection Corp.
Diamond Chrome. See U. S. Chromium Corp.
Duro Chrome. See General Chromium Corp.
General Chromium Corp., 3220 Bellevue Ave., Detroit, Mich. (Chromium Plate.)
Ideal Plating & Polishing Co., 55 Branford, Newark, N. J.
Metals Coating Co. of America, 495 N. Third, Philadelphia.
Metals Protection Corp., 401 Michigan, Indianapolis, Ind.
Parker Rust-Proof Co., 2177 E. Milwaukee, Detroit, Mich
Rochester Elec. Products Corp., 89 Allen, Rochester, N. Y.
United Chromium, Inc., 51 E. 42d, New York, N. Y.
Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish.)
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Baker & Co., Inc., 54 Austin, Newark, N. J.
Bishop & Co., Platinum Wks., J., Malvern, Pa.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 743 Market San Francisco, Cal.
Wilson Co., H. A., Newark, N. J.

**PLUG FUSES.** See Fuses and Fuse Wire.
**PLUG RECEPTACLES.** See Receptacles, Plug.
**PLUGS, Flashing.** See Flashers, Sign.
**PLUGS, Radio.** See Radio Receiver Parts.



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A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Arro-Grip. See Arrow Elec.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 636 N. Third, Newark, N. J.
Bee-Ell Elec. Mfg. Co., 79 Mercer, New York, N. Y.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill. (Special Soft Rubber Plug Furnished with Belden Cords).
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Bryant Elec. Co., Bridgeport.
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 33 Union Place, Hartford Conn.
Cetlite. See Monowatt Elec. Co.
Conco. See Connecticut Elec. Mfg. Co.
Circle F Mfg. Co., Trenton, N. J.
Colts Patent Fire Arms Mfg. Co., Hartford, Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Deal Electric Co., 453 Broome, New York, N. Y.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Eastman Mfg. Co., Manitowoc, Wis.
Edison Electric Appliance Co., 5618 W. Taylor, Chicago.
Electric Co., 94 Allyn, Hartford, Conn
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Esico Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
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Fitzall. See Rodale Mfg. Co.
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Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New
Gripall. See Beaver Mfg. Co.
Handle Cap. See Beaver Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co Hartford, Conn.
Heetach. See Marks Products Co.
Homco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Iffy See Esico Elec. Mfg. Co.
Kool Plug. See Colt's Patent Fire Arms Mfg. Co.
Leviton Mfg. Co., 226 Newell Brooklyn, N. Y
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Quartap. See Connecticut Elec. Mfg. Co.
Poloron Elec. Co., M., 26 Waverly Pl., New York, N. Y.
Propp Co., M., 534 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Renco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Safegard Elec. Appliance Co., 133 S. Twelfth, Philadelphia
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 2015 Powelton Ave., Philadelphia, Pa
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
Triple Tap. See General Elec. Co.
Twin Tap. See General Elec. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.
Yankee. See Beaver Mfg. Co.

**POCKET METERS.** See Instruments, Pocket.

### POINTS, Contact
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold. Platinum. Silver.)
Bishop & Co., Platinum Wks., J., Malvern, Pa.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory Co.), 550 Madison Ave., New York, N. Y.
Funstel Products Co., North Chicago, Ill.
General Plate Co., Attleboro, Mass.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Interstate Products Corp., 29 Commercial, Newark N. J. (Platinum and Silver.)
National Contact Co., 23 W. 60th, New York. (Platinum.)
Nichoff & Co., C. H., 230 W. Superior, Chicago. (Platinum.)
Spark-O-Metal. See Hardy Metal Corp.
Tungsten Electric Corp., 545 39th, Union City, N. J.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.




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Beads. See Beads, Insulating.
Bushings. See Bushings, Box & Cabinet.
Cement. See Cement, Liquid, Porcelain.
Insulators. See Porcelain.
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.
Tubes. See Porcelain.

### PORCELAIN, Special Shapes
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American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Central Porcelain Co., Columbiana, O.
Challenge Stamping & Porcelain Co., Grand Haven, Mich.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., 1 Centre Ave., West Orange, N. J.
Crowlite. See Crowley & Co.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metach Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard & Specialty Porcelain Co., Sun Prairie, Wis
Star Porcelain Co., Muirhead St., Trenton, N. J.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

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Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

### POSTS, Binding
Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
DeJur-Amsco Corp., 418 Broome, New York, N. Y.
Eby Mfg. Co., Inc., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros., Plano, Ill.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Polk, J. L., 41 Bell Ave., Troy, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.

**POTENTIOMETERS (Instruments).** See Instruments, Laboratory Standard.

**POTENTIOMETERS (Radio Control).** See Radio Receiver Parts.

**POWDERED CARBON.** See Carbon, Powdered.

**POWER TRANSMISSION CHAIN.** See Chain, Power Transmission.

**PRESS BOARD.** See Cloth and Paper.

### PRESSES, Armature Coil
Comstock Mfg. Co., Wilkes-Barre, Pa.

**PRESSES, ARMATURE NOTCHING.** See Notching Machines, Armature.

### PRESSES, Molded Insulation
Barnwarth Co., 244 N. Tenth, Newark, N. J.
Busch-Sulzer Bros. Diesel Engine Co., Second & Utah Sts., St. Louis, Mo.
Dunning & Boschert Press Co., 329 W. Water, Syracuse.
Duo-Press. See Busch-Sulzer Bros.
Elmes Engrg. Works, Chas. F., 230 N. Morgan, Chicago.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill
Farquhar Co., A. B., York, Pa.
French Oil Mill Machinery Co., Piqua, O.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd. (Olney), Philadelphia, Pa.
Terkelsen Machine Co., Terkelsen Bldg., Boston, Mass.

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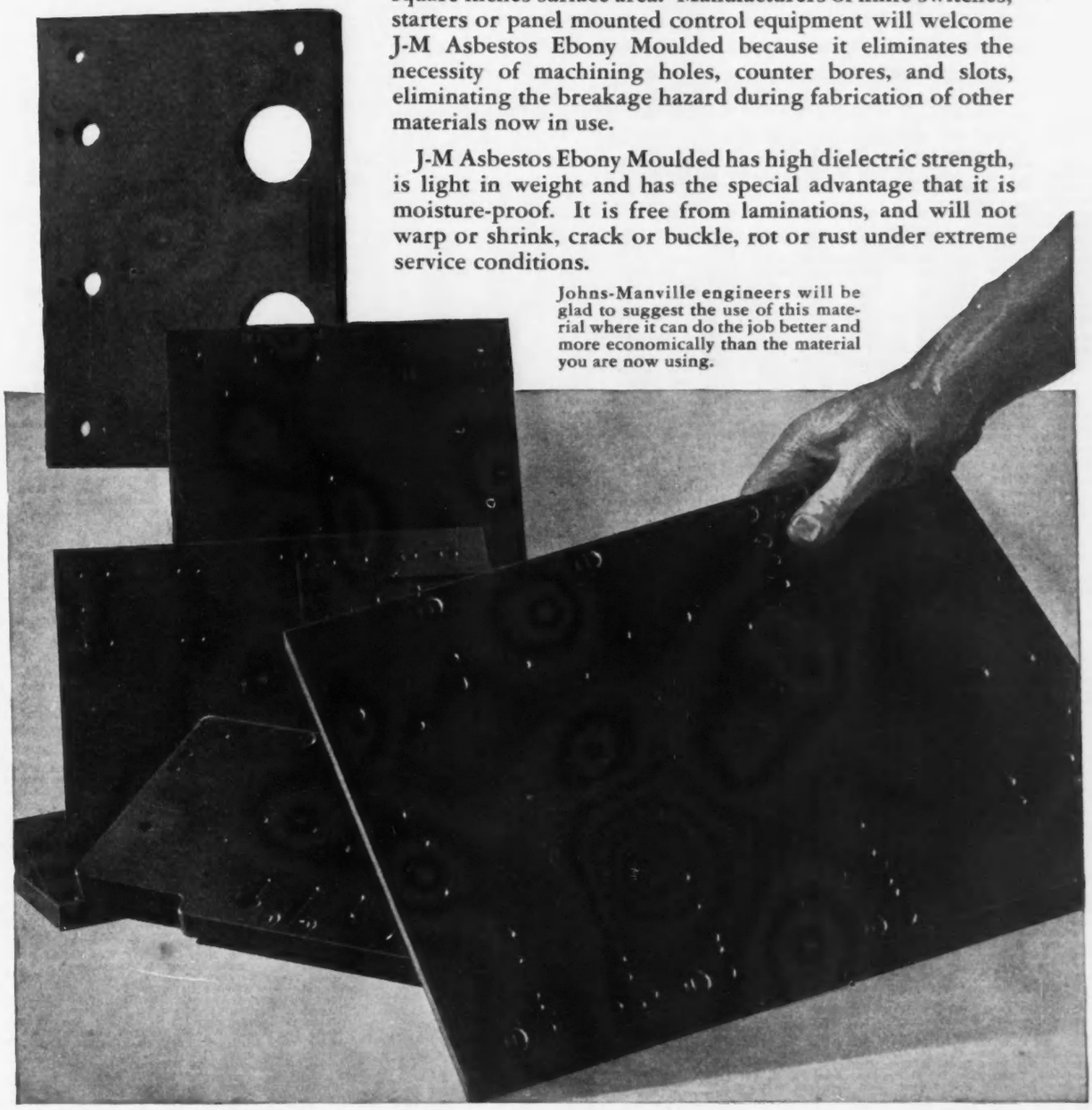

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**PRESSES, Porcelain Molding**
Baird, Andrew, 2715 Newark, Detroit, Mich

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Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y
Loshbough-Jordan Tool & Machine Co., Elkhart, Ind
Niagara Machine & Tool Wks., 637 Northland, Buffalo.
Peck, Stow & Wilcox Co., Southington, Conn.
**PRESSES, Stamping.** See Presses, Punching & Bending.
Rockford Iron Works, 846 Ray, Rockford, Ill.
**PRISMS, Chandelier.** See Crystals, Chandelier
**PROJECTOR LENSES.** See Lenses.

**PULLERS, Armature Shaft**
Motor Puller, Shaft & Pinion Pullers & Extractors
Allen Electric & Equipment Co., Kalamazoo, Mich.
Big Buster. See Premier Elec. Co
Crane Puller Co., West Newton, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff-Norton Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts Philadelphia, Pa.
Little Giant. See Premier Elec. Co.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill

**PULLEYS, Composition**
General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

**PUMPS, Oil Burner**
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.

**PUMPS, Vacuum**
To Exhaust Incandescent Lamps.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E. Cleveland, O.
Cenco. See Central Scientific Co.
Central Scientific Co., 460 E. Ohio, Chicago, Ill.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Elsler Elec. Corp., 756 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y
Megavac. See Central Scientific Co.
Packard. See Hubbard's Sons, Norman.
**PUNCHING PRESSES.** See Presses, Punching.

**PUNCHING and BENDING, Sheet Steel**
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass

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(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1820 Chouteau Ave., St. Louis Mo. (Tensionless Dereeler.
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

**RADIO CIRCUIT COMPONENTS**
This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
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Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Air-King Products Co., 216 Wallabout, Brooklyn, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Akra-Ohm. See Shallcross Mfg. Co.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Apparatus Co., Richmond, Ind.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic See Premier Elec Co.
Art Dial. See Pilot Radio & Tube Corp.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automatic Oil Heat Co., 9294 E. Fourth, St. Paul, Minn.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn.
B-Conomizer. See Pilot Radio & Tube Corp.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 227 Washington, Buffalo, N. Y
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y
Browning-Drake Corp., Calvary, Waltham, Mass.
Buffer. See Aerovox Wireless Corp.
Buffalo. See Jur-Amsco Corp.
Camfield. See Columbia Metal Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Radio & Tube Corp.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill.
Central Radio Corp., Beloit, Wis
Centraline. See Pilot Radio & Tube Corp.
Certified Condenser. See Radio Condenser Co
Chelten Elec. Co., 4859 Stanton Ave., Philadelphia, Pa
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O.
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J
Columbia Metal Products Co., 360 E. Grand Ave., Chicago.
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Cornell Elec. & Mfg. Co., Anable & Rawson, Long Island City, N. Y.
Crewradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crofot. See Premier Elec Co.
Cub. See Cornell Electric & Mfg. Co.




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9. Rheostats for all purposes.
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11. Theatre Dimmers.

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Daven Co., 158 Summit, Newark, N. J. (Kits)
Davohm See Daven Co.
DeForest Radio Co., Passaic, N. J.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich
Dubilier Condenser Corp., 342 Madison av., New York
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dynohmite See Lynch, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc., 350 Madison Ave., New York, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., 3982 Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp.
Filterettes. See Tobe Deutschmann Co.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Furnell Die Cast Condenser Corp., 16 Hudson, New York
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass
General Transformer Corp., 910 W. Jackson Blvd., Chicago
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co
Ger-Alt Radio Laboratories, 859 Flatbush Ave., Brooklyn, N. Y. (Adapter.)
Glastor. See Daven Co.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y
Harmonik. See Karas Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co
Heinemann Elec. Co., Trenton, N. J.
Held-Tite, Hi-ohm, Hi-pot. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Hum-Dinger. See Clarostat Mfg. Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 4322 Lake Ave., Rochester N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa
Isograd, Isoleak. See Pilot Radio & Tube Corp
Jefferson Electric Co., 1500 S. Laflin, Chicago, Ill.
J-M-P. Mfg. Co., 3320 Fond du Lac Ave., Milwaukee, Wis
Karas Elec Co., 4040 N. Rockwell, Chicago, Ill
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y
Kilograd. See Pilot Radio & Tube Corp.
Krobiack. See Mountford, C. E.
Kunrox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn
Lavite. See Aerovox Wireless Corp
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J (Radio Resistance)
Leakandenser. See Daven Co.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I
Maxitrap See Electrical Research Laboratories
Mayo Laboratories, Inc., 281 E. 137th, New York, N. Y.
Mayolian Corp., 1668 Webster Ave., New York, N. Y (Tone Filter.)
Meggit. See Cole Mfg. Corp.
Meleo-Supreme. See De Jur-Amsco Corp.
Melecupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y (Amplifier Kit.)
Mica-Static See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser See Sterling Mfg. Co
Microgrid. See Pilot Radio & Tube Corp.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 3440 S. Chicago Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Radio & Tube Corp.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill (Resistance.)
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthosonic. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol See Wireless Radio Corp.



Perry Elec'l Resistor Corp., 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 105 7th Ave., New York, N. Y.
Plandor. See De Jur-Amsco Corp.
Pierce Airo. See United Scientific Laboratories.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Radio & Tube Corp.
Potter Mfg. Co., North Chicago, Ill.
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 121 Ingraham, Brooklyn, N. Y.
Precision Coil Co., 122 Greenwich, New York, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill
Protectoralds. See Alden Mfg. Co.
Pyrotun. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y (Short Wave Kit.)
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Radio & Tube Corp.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Scovill Mfg. Co., Waterbury, Conn.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Shallcross Mfg. Co., 700 Parker Ave., Collingdale, Pa.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 6401 W. 65th St., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave Cleveland, O
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Submarinet. See J-M-P Mfg. Co.
Super Multiformer. See Precise Mfg. Corp
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thomas Engineering & Mfg. Co., 616 S. Michigan Ave., Chicago, Ill.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Transcontinental Coil Co., 5 Kirk Place, Newark, N. J.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tunadapta. See Lynch, Arthur H.
Tuway. See Carter Radio Co.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Ultra Vario. See Bruno Radio Corp
Univernier Condenser. See Auburn Button Works.
Universal Electro Chemical Corp., 30 W. 15th, New York.
Universal Winding Co., Boston, Mass.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Variall Condenser. See Muter Co.
Volta. See Universal Electro Chemical Corp.
Volumgrad. See Pilot Radio & Tube Corp.
Walbert Radio Corp., 1000 Fullerton Ave., Chicago, Ill.
Ward Leonard Electric Co., 31 South, Mount Vernon, N. Y.
Waterbury Button & Moulding Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass
**RADIO HARDWARE.** See Radio Mountings.

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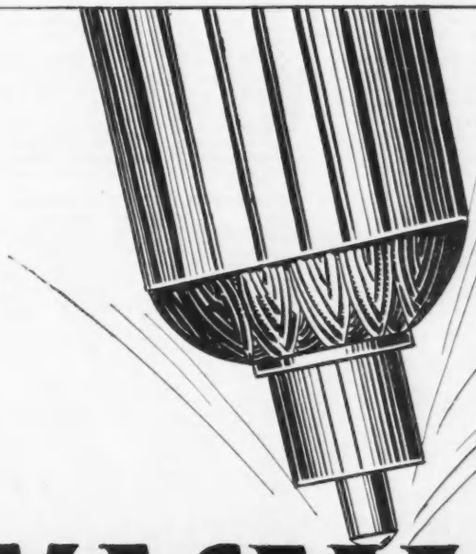
Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York.
Bonzo. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Master Engineering Co., 122 S. Michigan Ave., Chicago, Ill.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 3440 S. Chicago Ave., Chicago
Na-Ald. See Alden Mfg. Co.
Union Insulating Co., 296 Broadway, New York, N. Y.
Waddell Mfg. Co., Grand Rapids, Mich.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.
**RADIO PANEL ENGRAVING.** See Engraving, Radio Panel.

**RADIO RECEIVER PARTS**
Rheostats, Sockets, Plugs, Jacks.
Acme Elec. & Mfg. Co., 1853 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amacostat. See American Apparatus Co.
American Apparatus Co., Richmond, Ind.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Bussez Ave., Newark, N. J
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Cahelug. See Jones, Howard B.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill. (Also Socket Adapters.)



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**RADIO RECEIVER PARTS**—Continued
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
De Veau. See Stanley & Patterson
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
Dynofilter Mfg. Co., 1922 E. 178th, New York, N. Y. (Interference Eliminator).
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa
Electrad, Inc., 173 Varick, New York, N. Y.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Trenton, N. J.
Imp. See Carter Radio Co.
Jones, Howard B., 2300 Wabansia, Chicago. (Multiple Plug)
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Microgrid. See Pilot Radio & Tube Corp.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 3440 S. Chicago Ave., Chicago.
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty. See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Socostat. See D. A. Radio Co.
Sterling Mfg. Co., 2331 Prospect Ave., Cleveland, Ohio
Tubestat. See Muter Co.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn
Workrite Radio Corp., 1838 E. 30th, Cleveland, O.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

## RADIO RECTIFIER TUBES

Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
Arcturus Radio Tube Co., 260 Sherman Ave., Newark, N. J
Cable Radio Tube Corp., 80 N. Ninth, Brooklyn, N. Y.
Ceco Mfg. Co., 1200 Eddy, Providence, R. I.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J
Cunningham, Inc., E. T., 870 Seventh Ave., New York, N. Y
Daven Co., 158 Summit, Newark, N. J.
DeForest Radio Co., Passaic, N. J.
Diamond Electric Co., Newark, N. J.
Diamond Vacuum Products Co., 4058 Diversey Ave., Chicago
Eveready Raytheon. See National Carbon Co.
Gold Seal Electrical Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hygrade Lamp Co., Salem, Mass.
Hytron Corp., Salem, Mass.
Jaeger Research Laboratories, 280 Park Ave., Weehawken, N. J.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
La Salle Radio Corp., Div. of Matchless Elec. Co., 1500 N. Ogden Ave., Chicago, Ill.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
National Carbon Co., New York, N. Y.
National Radio Mfg. Co., 1020 S. Central Park Ave., Chicago, Ill.
Neptron. See Hygrade Lamp Co.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Paramount Mfg Co. 79 Orange, Newark, N. J.
Pentode. See Ceco Mfg. Co.
Perryman Electric Co., 4901 Hudson Blvd., North Bergen, N. J.
Radio-Victor Corp. of America, 233 Broadway, New York.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington N. J.

**RADIO TRANSFORMERS.** See Radio Circuit Components
**RADIO TUBE BASE BRANDERS.** See Engraving Radio Panel.
**RADIO TUBE BASES.** See Radio Molded Parts.
**RADIO TUBE BULBS (Unfinished).** See Bulbs, Glass.

## RADIO TUBE PARTS

Filament Hooks, Screens, Bolts & Nuts & Special Stampings.
Juno Fasteners, Inc., Hillside, N. J.
Newark Wire Cloth Co., 351 Verona Ave., Newark, N. J. (Screens).

## RADIO WIRING HARNESS

Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Ajax Elec. Specialty Co., 1936 Chestnut, St. Louis, Mo.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Wire Corp.
Alpha Wire Corp., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Wire Corp.
American Braiding Co., Holyoke, Mass.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid, Inc.
Brach Mfg. Co., L. S., Newark, N. J.
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid, Inc., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Diamond Braiding Mills, Chicago Heights, Ill.
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind. (Adapters.)
Hatfield Rubber Wks., Inc., Hillside, N. J.
Lusterised. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters)
Radio Receptor Co., 106 Seventh Ave., New York, N. Y (Adapters.)
Riga. See Birnbach Radio Co.
Sterling Mfg. Co., 2331 Prospect Ave., Cleveland, Ohio (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N Y

## RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.



Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.
**RANGE SWITCHES.** Rotary Snap. See Switches, Snap, Heavy Duty.
**RAWHIDE GEARS.** See Gears & Pinions, Rawhide.
**READING LAMP BASES.** See Bases, Reading Lamp.
**REAMERS, Pipe.** See Stocks, Dies and Reamers.
**RECEPTACLES, Lamp.** See Sockets and Receptacles.

## RECEPTACLES, Plug, Heavy Duty

| | KEY |
|---|---|
| Battery Charging | See B |
| Floor Boxes | See F |
| Welding | See W |
| Machine Tool | See W |
| Watertight, Marine, Mine | See M |
| Car Trailer Connection | See C |
| Extension | See E |

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O.. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Armstrong Electric Co., 13 Water, New York M
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 53, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Condulette. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse, N. Y. B W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4123 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
Fullman. See Steel City Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. B
Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
Lexington Electric Products Co., 12 Chapel, Newark, N. J. C
Loeffelholz & Co., Milwaukee, Wis. C
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Neco. See Novelty Elec. Co.
NePage McKenny Co., Seven Front, Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Rales Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa.. F E
Thomas & Betts Co., 15 Park Place, New York, N. Y. F
V. V. Pittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 12 E. 41st St., New York, N. Y. E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.

**RECORDERS, Elapsed Time.** See Indicators, Operation
**REDUCERS, Socket.** See Socket Reducers.
**REFLECTOR LENSES.** See Lenses.

## REFLECTORS, Porcelain Enameled, Steel

4Bolite Reflector Co., 7500 Sherman Ave., Cleveland O
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 3700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 2901 N. Oakley Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co
Jumbo. See Quadrangle Mfg. Co.
Marbelite Art Products Co., 140 N. Robey, Chicago, Ill
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill
Oamed. See Overbaugh & Ayers.



Gage List of
Electrical Buyers
*The Trade Authority*

Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.
**REFRACTORIES, Porcelain.** See Cores Resistance Coil.
**REFRIGERANTS.** See Chemicals, Refrigeration.
**REFRIGERATION CHEMICALS.** See Chemicals, Refrigeration.

## REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
American Refrigerator Corp., Peru, Ind.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectriCE Corp., Belding, Mich.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Cavalier. See Tennessee Furniture Co.
Champion Refrigerator Co., 206 Lexington Ave., New York
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dry-Air. See Baldwin Refrigerator Co.
Dry-Cold. See Hill & Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Hauskelite Mfg. Co., 120 S. La Salle, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Frunt & Olney Aves., Philadelphia, Pa.
Heins & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Howe Scale Co., Rutland, Vt.
Jewett Refrigerator Co., Buffalo, N. Y
Kingston. See Lorillard Refrigerator Co
Kleen Kold. See Harder Refrigerator Corp.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Kelvinator Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 40 Cooper Square, New York.
Louisville Refrigerator Corp., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2864 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Plymetl. See Hauskelite Mfg. Co.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

**REFRIGERATOR CONDENSER UNITS.** See Condenser Units, Refrigerator.

## REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

## REGULATORS, Temperature

American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. (Mercury Switch Type.)
American Teletherm Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Basel Mfg. Co., 911 Mulberry, Kansas City, Mo.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Ceaco. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston
Cook Elec. Co., 3700 Southport Ave., Chicago, Ill.
Davis & Daggett Co., 338 Dwight, Springfield, Mass.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Dunco. See Struthers Dunn, Inc.
Electric Automatic Appliance Co., Denver, Col.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.
Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Mercoid Corp., 504 W. Adams, Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Electric Switch Co., Des Moines, Iowa.
Penn Heat Control Corp., 15 & Chestnut Sts., Philadelphia, Pa.
Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill
Protectostat. See Minneapolis-Honeywell.
Quick Freeze. See Penn Electric Switch Co.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Stanley Heat Regulator, 2938 Pillsbury Ave., Minneapolis
Snapon. See Tagliabue Mfg. Co.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Sure Fire. See Boston Machine Wks.
Tagliatue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.

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5. Laboratory Resistors and Rheostats.
6. Motor Starters and Controllers A. C. and D. C.
7. Radio Resistors and Rheostats.
8. Resistors for all purposes.
9. Rheostats for all purposes.
10. Speed Controllers.
11. Theatre Dimmers.

WARD LEONARD ELECTRIC CO.
31-41 South St. Mount Vernon, N. Y.

**REGULATORS, Temperature—Continued**
Time-O-Stat Controls Co., Crambiet Engineering Div., 286 Milwaukee Ave., Milwaukee, Wis.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
White Mfg. Co., 2362 University Ave., St. Paul, Minn.
Wilcolator Co., Newark, N. J.
Wilson-Maulin Co., 383 Concord Ave., New York, N. Y.

## REGULATORS, Voltage

American Instrument Co., 774 Girard, N. W., Washington, D. C.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Marshall Electric Co., Elkhart, Ind.
Motor. See Ward-Leonard Electric Co.
States Co., 19 New Park Ave., Hartford, Conn.
Ward-Leonard Electric Co., 31 South, Mount Vernon, N. Y. (See also Circuit Breakers and Thermostats.)

## RELAYS

American Brown Boveri Elec. Corp., Camden, N. J.
Automatic Switch Co., 154 Grand, New York, N. Y.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Electric B-G Products Co., Ithaca, Mich.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
Leach Relay Co., 695 Mission, San Francisco, Cal.
McWilliams. See Electric B-G Products Co.
Roller-Smith Co., 289 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

**REMOTE CONTROL SWITCHES.** See Switches, Remote Control.

## REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

**RESISTANCE**
Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments
Units, Radio. See Radio Circuit Components
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

## RESISTORS

Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Ward Leonard Electric Co., 31 South, Mount Vernon, N. Y.

**RESISTORS.** See Units, Rods & Grids.
**RESURFACERS, Commutator.** See Stones, Commutator, also Tools, Commutator Truing.
**REVOLUTION COUNTERS.** See Tachometers.

**RHEOSTATS,**
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

## RHEOSTATS

| | KEY |
|---|---|
| Battery Charging | See B |
| Stage Dimming | See D |
| Meter Testing (Laboratory) | See L |
| Plating Tank | See P |
| Motion Pictures (Projector Lamp) | See M |
| Motor Starting, Field and Speed Regulating | See F |

| | F | B | D | P | M | L |
|---|---|---|---|---|---|---|
| Allen-Bradley Co., 494 Reed, Milwaukee | | | | | | L |
| Biddle, James G., 1211 Arch, Philadelphia | | | | | | L |
| Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.) | | B | | | | |
| Bradleystat. See Allen-Bradley Co. | | | | | | |
| Columbia Electric Mfg. Co., 1292 E. 52nd, Cleveland, O. | | | | P | | |
| Controlite. See Ward Leonard Elec. Co. | | | | | | |
| Crown Rheostat & Supply Co., 1908 Maypole Ave., West Chicago, Ill. | | | | P | | |
| Cutler-Hammer, Inc., 1258 St. Paul Ave., Milwaukee, Wis. | F | B | D | | | L |
| Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. | F | | | | | |
| Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. | F | | | | | |
| Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. | | B | | | | |
| General Electric Co., Schenectady, N. Y. | F | | | | | L |
| Hanson-Van Winkle-Munning Co., Matawan, N. J. | | | | P | | |
| Holzmuller, C. J., 1108 Howard, San Francisco, Cal. | | | | D | | |
| Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. | | | | D | M | |
| Knoeller Elec. Co., De Pere, Wis. | F | | | | | |
| National Elec. Controller Co., 5315 Ravenswood Ave., Chicago | F | B | D | | M | L |
| Optimus. See Hanson-Van Winkle-Munning Co. New York, N. Y. | | | | | M | |
| Rubicon Co., 29 W. Sixth, Philadelphia | | | | | | L |
| Schaefer Bros. Co., 1059 W. 11th, Chicago | | B | | | | |
| Simplicity. See Cutler-Hammer Mfg. Co. | | | | | | |
| Robertson, Leo F., Inc., 532 W. 22nd, | | | | | | |

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WORCESTER, MASS.

Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis. | F
Universal. See Ward Leonard Elec. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y. | F | D | M
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. | F | M

**RINGS Seal.** See Packing.

## RIVETS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
American Brass Co., Waterbury, Conn.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 83 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

**RODS, Resistance.** See Units, Rods and Grids.
**ROLLER BEARINGS.** See Bearings, Ball and Roller.

## ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

**RUBBER BELTS.** See Belts, Rubber.

## RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co. B. F., Akron, O.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Luzerne Rubber Co., Muirhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Corp., Trenton, N. J.
Radelite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

## RUBBER, MECHANICAL GOODS

Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co., Youngstown, O.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.

**RUBBER, SEMI-HARD.** See Rubber Mechanical Goods.

## RUBBER, Sponge

Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.

**RUBBER TAPE.** See Tape, Rubber and Friction.
**RUBBER TUBING.** See Tubing, Rubber.
**RUST PROOFING.** See Plating & Finishing.
**SAL AMMONIAC.** See Chemicals, Battery.
**SALTS, Battery.** See Chemicals, Battery.
**SATURATING TANKS.** See Wire Manufacturing Machines
**SCREW SHELLS, Socket.** See Shells, Screw Socket.

## SCREW DRIVING MACHINES

Vim Electric Tool Co., 149 Broadway, New York, N. Y.

## SCREW MACHINE PRODUCTS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
American Metal Wks., 4965 Stanton Ave., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur Ill.
Hanson, Einar R., 17 Hermon, Worcester, Mass.
Hubbell, Inc., Harvey, Bridgeport, Conn.

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WARD LEONARD ELECTRIC CO.
31-41 *South St., Mount Vernon, N. Y.*

Indianapolis Screw Products Co., 621 N. Noble, Indianapolis.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Linden & Co., 891 Broad, Providence, R. I.
Mattatuck Mfg. Co., Waterbury, Conn.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Parent Machine & Screw Co., 50 Canal, Salem, Mass.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Shimer & Sons, Samuel J., Milton, Pa.
Steiner & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

## SCREWS, Cap (Cut Thread)

Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

## SCREWS, Drive

Parker-Kalon Corp., Dept. K., 190 Varick, New York, N. Y.

## SCREWS, Machine

Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., 1818 Broadway, Rockford, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

## SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.

**SECOHMMETERS.** See Instruments, Laboratory Standard.
**SEGMENTS.** See Discs, Armature.

## SEPARATORS, Storage Battery

Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

## SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

## SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo Parchment.
Acme Lamp Shade Co., 630 West Jackson Blvd., Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)

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**SHADES, Fabric**—Continued
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chints.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 22rd, New York. (Bamboo, Silk, Cretorne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 33 W. 24th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 18 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1296 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 824 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman & Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

## SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 224 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

**SHADES, FACTORY WINDOW.** See Window Shades, Factory.

## SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oameo. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

## SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

**SHAFT COUPLINGS.** See Couplings, Shaft.
**SHAFTS, Flexible.** See Tubing, Flexible Metallic.
**SHEARS, Metal Cutting.** See Shears, Power.
**SHEARS, Rotary.** See Shears, Power.

## SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

## SHEARS, Power

Niagara Machine & Tool Wks., 637 Northland, Buffalo, N. Y.

**SHEET STEEL CABINETS.** See Cabinets, Sheet Steel.

## SHELLS, Screw Socket

Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass Inc., 820 Orleans, Chicago, Ill.
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn. (Miniature.)

**SHUNTS, Instruments.** See Instruments, Laboratory Standard.
**SIGN FLASHERS.** See Flashers, Sign.
**SIGN LETTER LENSES.** See Lenses.

## SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

**SILK, Cloth Insulated.** See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

## SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

**SILVER SOLDER.** See Solder, Silver.
**SINE WAVE OSCILLATORS.** See Instruments, Laboratory Standard.
**SIGN ELECTRODES, Gas.** See Electrodes for Gas Signs.
**SKINNERS WIRE.** See Scrapers.
**SLABS, Switchboard.** See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.



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*Office, Portland, Maine*

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Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Pennbyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

**SLEEVE-BEARINGS.** See Bearings and Bushings.
**SLEEVING, Cotton.** See Tape, Cotton.
**SLOTTING FILES.** See Files, Commutator Slotting.

## SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3242 Monroe, Toledo, O.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio
Simplex. See Weidenhoff, Joseph.
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4852 Roosevelt Rd., Chicago, Ill.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

**SNAP SWITCHES.** See Switches, Snap

## SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Kirchberger & Co., Inc., 1425 37th, Brooklyn, N. J.
Lin-Stun. See Westinghouse.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

**SOCKET LININGS.** See Linings, Socket
**SOCKET SHELLS.** See Shells, Screw Socket.
**SOCKETS, Flashing.** See Flashers, Sign.

## SOCKET Chain Attachments

Chain Links, Chain Adjusters, Acorns, Extensions, Insulated Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn. (Acorns.)
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

## SOCKET REDUCERS

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cen-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 79 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart & Hegaman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.

**SOCKETS, Radio.** See Radio Receiver Parts.

## SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

| | |
|---|---|
| Key | See K |
| Composition | See W |
| Metal Shell | See B |
| Porcelain | See A |
| Pull Chain | See P |
| Push Through | See T |
| Sign Receptacles | See A |

A. B. C. See Leviton Mfg. Co.
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. . . . . A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. . . . . W
Alabax. See Arrow Elec. Co.
Alcor Mfg. Co., 4605 W. Madison, Chicago, Ill. . . . . C
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. . . . . A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. . . . . A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A
Arrogrip. See Arrow Elec. Co.
A. & W. See General Outdoor Adv. Co.



Beaver Mfg. Co., 625 N. Third, Newark, N. J. . . . . C . . . . P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport. . . . M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. . . . M . . K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. . . . . .
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . M . . K T . . B A
Crouse-Hinds Co., Syracuse, N. Y. . . A W . . . . . .
Cutler-Hammer, Inc., 1237 St. Paul Ave., Milwaukee, Wis. . . . . K T . . B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . P B . .
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. . . . . C . . . . . .
Federal Electric Co., 8700 S. State, Chicago, Ill. . . . . A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. . . . . M C . . . . . B . .
Gaynor Elec. Co., Stratford, Conn. . . . . A
General Elec. Co., Merchandise Dept., Bridgeport, Conn. . . . . M C K T P B A
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . M C K T P B A
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y. . . . . W . . . . . .
Horan Co., E. S., 550 Monroe, Carlstadt, N. J. . . . . A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) . . . . . .
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1007 Sansom, Philadelphia, Pa. . . . . A
Leviton Mfg. Co., 236 Newell, Brooklyn, N. Y. . . . . M C K . . P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. . . . . P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) . . . . . A
Molded Socket Corp., Railroad, Pa. . . . K . . . . .
Multi Elec'l Mfg. Co., 1340 W. 14th, Chicago, Ill. . . . . A
Multilok. See Circle F Mfg. Co.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. . . . . M C K T P B A
Paulding, John L., New Bedford, Mass. . . . . B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. . . . . A
Propp Co., M., 524 Broadway, New York, N. Y. . . . . .
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J. . . . . W . . . . . A
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 50 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. . . . . .
Taplet Mfg. Co., 3709 Pewelton Ave., Philadelphia, Pa. . . . . A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. . . . . A
Union Insul. Co., Parkersburg, W. Va. . . . . A
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. . . . . P . . B . . W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. . . . . A
Walco. See Leiser & Co., W. A.
Waterbury Button & Moulding Co., Waterbury, Conn. . . . . .
Watson Mfg. Co., J. E., 5508 N. Fifth, Philadelphia, Pa. (Concealed Fixture) . . . . . P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. . . . . P . . .
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) . . . . . A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

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Aluminum Solder Corp. of America, 730 Fifth Ave., New York, N. Y.
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Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Solderiume. See Aluminum Solder Corp. of America.
Supreme. See Lasher-Weeber Co.

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Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.
National Bearing Metal Corp., Div. More-Jones Brass & Metal Co., 4230 Manchester Ave., St. Louis, Mo.

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Dutch-Boy. See National Lead Co.
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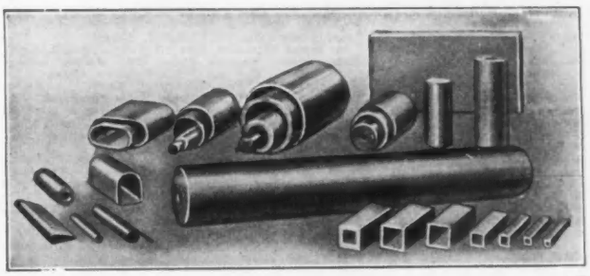

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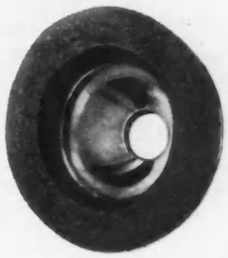

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**VALPARAISO INDIANA**

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### STEEL for Electric Appliances
Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

### STEEL, Magnet
Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.
Reed Co., Jr., David, 85 Adams, Brooklyn, N. Y.
Swedmag. See Reid Co., Jr., David.

### STEEL SHEETS
Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armco. See International Corp., Middletown, O.
Armelec. See Empire Steel Corp.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Manelec. See Empire Steel Corp.
Metelec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Poleiec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Tranelec. See Empire Steel Corp.
Unilov. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
STEEL, STRIP. See Strip Steel.

### STOCKS, Dies and Reamers
Hall-Will, Inc., Twelfth & Cranberry, Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

### STONES, Commutator
Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

### STOOLS, Factory; Steel
Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 613 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1140 South Michigan Ave., Chicago.

### STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

### STRAIGHTENERS, Armature Shaft
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

### STRIP STEEL
(Hot and Cold Roll).
Acme Steel Co., 2840 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. (Cold).
Athenia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Central Alloy Steel Corp., Massillon, O. (Hot.)
Griffin Mfg. Co., Huron & Cherry, Erie, Pa. (Cold.)
Laclede Steel Co., 8th & Olive Sts., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., Union Trust Bldg., Pittsburgh, Pa. (Hot & Cold.)
Thomas Steel Co., Warren, Ohio.
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

### STRIPPERS, Wire
Acme. See A. Laubscher.
Artos Engineering Co., 115 Brown, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Carlander, Henry, 508 W. 146th, New York, N. Y.
Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
France Mfg. Co., 10306 Berea Rd., Cleveland. (Motor Driven.)
Goebel. See Klein & Son.
Hartman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Pyramid Products Co., 2311 S. State, Chicago, Ill.
Service Sales & Mfg. Co., 17005 Melgrave Ave., Cleveland, Ohio.
Speedcraft. See Wire Stripper Co.
Thomas Steel Products Co., Warren, Ohio.
Weber Machine Corp., 33 S. Water, Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARD OPALS. See Lenses.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.



Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

### SWITCHES, Battery and Baby Knife
Cut-Out Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Jefferson Electric Co., 1503 S. Laflin, Chicago, Ill.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Trenton, N. J.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Majestic Elec. Mfg. Co., 80 N. 12th St., St. Louis, Mo.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

### SWITCHES, Mercury
(For Temperature Control Apparatus.)
Con-Tac-Tor. See Time-O-Stat Controls Co.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Dunco. See Struthers Dunn, Inc.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Electric Vapor Lamp Co., 883 Adams, Hoboken, N. J.
Leland Electric Co., Dayton, O.
Kontax. See Leland Electric Co.
Kontroler. See Leland Electric Co.
Machlett & Son, 50 William, Long Island City, N. Y.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

### SWITCHES, Motor Starting
Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dall Mfg. Co., 311 N. Tenth, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Narco. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.



PEAK LOAD
MERCURY SWITCHES
E. Machlett & Son
50 William St., Long Island City, N. Y.

Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2323 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

### SWITCHES, Remote Control
Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
Electric Valve Mfg. Co., 68 Murray, New York, N. Y.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Div. of Square D Co., Milwaukee, Wis.
Isato Engr. Co., Mankato, Minn.
Lincoln Elec. Co., Colt Rd. & Kirby Ave., Cleveland, O.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
States Co., 19 New Park Ave., Hartford, Conn.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

### SWITCHES, Snap

| | KEY |
|---|---|
| Feed Through | See p |
| Fixture (Canopy, Candelabra and Key Arm) | See F |
| Flush | See f |
| Lever, Toggle, Tumbler | See L |
| Pendant | See p |
| Push Button | See P |
| Rotary | See R |
| Surface | See s |

See Also Switches, Snap; Heavy Duty.

| | | | | | | |
|---|---|---|---|---|---|---|
| Adam Electric Co., Frank, St. Louis, Mo. | f | | | | | |
| Anylite Elec. Co., Ft. Wayne, Ind. | | | | | L | |
| Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. | f | sp | P | R | L | F |
| Arrow Head. See Arrow Elec. | | | | | | |
| Beaver Mfg. Co., 625 N. Third, Newark, N. J. | f | p | P | | | F |
| Best. See United States Elec. Mfg. Corp. | | | | | | |
| Brascolite. See Guth & Co., Edwin. | | | | | | |
| Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. | f | | | | | |
| Bridgeport Switch Co., 209 Center, Bridgeport, Conn. | | | | | L | F |
| Bryant Elec. Co., Bridgeport, Conn. | f | sp | P | R | L | F |
| B. S. Co. See Bridgeport Switch Co. | | | | | | |
| Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. | | | | | | F |
| Commercial. See Gaynor Electric Co. | | | | | | |
| Connecticut Elec. Mfg. Co., Bridgeport, Conn. | | p | P | R | L | F |
| Crouse-Hinds Co., Syracuse, N. Y. | | | | | L | |
| Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. | | P | | | L | |
| Diamond H. See Hart Mfg. Co. | | | | | | |
| Dugle. See Bryant Elec. Co. | | | | | | |
| Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. | | | | | | F |
| Gaynor Elec. Co., Stratford, Conn. | f | | | | L | |
| General Elec. Co., Bridgeport, Conn. | f | sp | P | R | L | F |
| Glo-Guide. See Bryant Elec. Co. | | | | | | |
| Gold Star Push Switch. See Hart & Hegeman. | | | | | | |
| Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. | | | | | | |
| Hart Mfg. Co., Hartford, Conn. | f | sp | P | R | L | |
| Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control) | f | sp | P | R | L | F |
| Hart. See Hart & Hegeman. | | | | | | |
| H. & H. See Hart & Hegeman Mfg. Co. | | | | | | |
| Hubbell, Inc., Harvey, Bridgeport, Conn. | | sp | | | L | F |
| Jost. See Morse, Frank W. | | | | | | |
| Kell & Son, Francis, 401 E. 163rd, New York, N. Y. | f | | P | | | F |
| Leviton Mfg. Co., 226 Newell, Brooklyn | | | | | | F |
| Levolier. See McGill Mfg. Co. | | | | | | |
| McGill Mfg. Co., Valparaiso, Ind. | f | | | | L | F |
| Marks Products Co., 80 N. Ninth, Brooklyn, N. Y. | | | | | L | F |
| Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. | s | | | B | | |
| Morse Co., Frank W., 291 Congress, Boston | | | P | | | |
| National. See Standard Elec. Mfg. Co. | | | | | | |
| New England. See Paulding, John L. | | | | | | |
| Nutmeg. See Hubbell, Harvey, Inc. | | | | | | |
| Operite. See Morse Co., Frank W. | | | | | | |
| Pass & Seymour, Solvay Sta., Syracuse, N. Y. | f | sp | P | | L | F |
| Paulding, John L. New Bedford, Mass. | f | s | P | | | |
| Pen Tap. See Beaver Mfg. Co. | | | | | | |
| Perkins. See Bryant Elec. Co. | | | | | | |
| Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y. | | | | | L | |
| Pilotoggle. See Pilot Radio & Tube Corp. | | | | | | |
| Pilotoggle. See Pilot Elec. Mfg. Co. | | | | | | |
| Pullrite. See Morse, Frank W. | | | | | | |
| Rodale Mfg. Co., 300 Hudson, New York | p | | | | | |
| Sears, Henry D., 80 Boylston, Boston | f | sp | P | R | L | F |
| Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. | | | P | | | |
| Snapit. See Marks Products Co. | | | | | | |
| Spartan. See Bryant Elec. Co. | | | | | | |
| Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. | f | | P | R | L | |
| Triglo. See Bryant Elec. Co. | | | | | | |
| Tumbolier. See Hart & Hegeman. | | | | | | |

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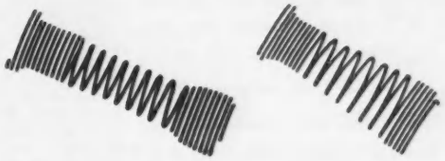
**VALPARAISO, INDIANA**

# Coiled Springs



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**Electrical Manufacturer**

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BRISTOL, CONNECTICUT

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COLD ROLLED SPRING STEEL — SCREW MACHINE PARTS
SPRING WASHERS — ASSEMBLIES — SMALL STAMPINGS
**SPRINGS**

**SWITCHES, Snap—Continued**
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y.
Victor. See Kell & Son, Francis.
Washington. See Gaynor Electric Co.
Weber. See Sears, Henry D.
Werkrite. See Morse, Frank W.
Yankee. See Bryant Elec. Co.

## SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., Kent, O.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

## SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.

## SWITCHES, Tank

Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 125th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

## SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Astrachron. See Gem Engineering Co.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1364 Folsom, San Francisco, Cal.
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Eureka Tool & Machine Co., 43 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horn Signal Mfg. Co., 290 Hudson, New York, N. Y.
Horolectrical Corp., 9 Desbrosses, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Knowles, W. E., 2369 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1429 St. Clair Ave., Cleveland.
Paragon Elec. Co., 400 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2269 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland.
Tork Clocks, Inc., 13 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 342 Madison Ave., New York.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

## TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad Sts., Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Misener Mfg. Co., 326 E. Washington, Syracuse, N. Y.
Productimeter. See Durant Mfg. Co.
Standeo. See Sticht & Co.
States Co., 19 New Park Ave., Hartford, Conn.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elect. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.
Zarnikow Co., O., 15 Park Row, New York, N. Y.

## TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brecklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button & Moulding Co., Waterbury, Conn.

## TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

**TAMPING TOOLS, COIL.** See Tools, Commutator Truing.
**TANK SWITCHES.** See Switches, Tank.
**TANKS, TINNING.** See Wire Manufacturing Machines.

## TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp., New York, N. Y.



Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

## TAPE, Cotton, Linen, Silk; Tape, Sleeving, Webbing.

Alfalfa. See Burrell Belting Co.
Anchor Webbing Co., 300 Brook, Pawtucket, R. I. (Cotton, Silk).
Asbeco. See Anchor Webbing Co.
Dermaline. See Burrell Belting Co.
Burrell Belting Co., 413 S. Hermitage Ave., Chicago, Ill.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

## TAPE, Mica

Chicago Mica Co., 845 Campbell, Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

## TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Ackurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okenite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York, N. Y.
Impervo. See Canfield Rubber Co.
Ireo. See Imperial Rubber Co.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson. See Okonite Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relio. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Sitco. See Superior Insulation Tape Co.
Slipknot. See Plymouth Rubber Co.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Usco. See United States Rubber Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

## TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

## TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridion Company, Frank, Boston, Mass.
Secor. See Electric Service Supplies Co.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y. (Automatic.)



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For Low and High Temperatures
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Our No. 2800 metal for temperatures up to 1500° F.
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American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

**TAPS.** See Stocks, Dies and Reamers.
**TENSION DEVICES, Coil Wire.** See Racks, Wire Reel.

## TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

## TERMINALS AND CONNECTORS

Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Burton-Rogers Co., Boston, Mass.
Cabeling. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kuller Elec. Mfg. Co.
Kuller Elec. Mfg. Co., 575 Pierce Ave., Long Island City
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. B. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury Button & Moulding Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sts., Cleveland, O.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 6 Howard, New York.

## TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Mihe Company, 717 Sycamore, Cincinnati, Ohio.
North East Appliance Corp., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

**TESTING INSTRUMENTS.** See Instruments.

## TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co., also Case Elec.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Case Elec. Co., Marion, Ind.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St Louis Mo.
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Ga-Ja-Met. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 29 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kletzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Mihe Company, 717 Sycamore, Cincinnati, Ohio.
North East Appliance Corp., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Allen Elec. & Equip. Co.
Portometer. See Allen Elec. & Equip. Co.
Portostat. See Allen Elec. & Equip. Co.
Presto. See Metal Specialties Mfg. Co.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Servwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
States Co., 19 New Park Ave., Hartford, Conn. (Transformer Test Table)
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

## TESTING LABORATORIES

Baker & Co., Inc., 54 Austin, Newark, N. J.
Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.

**THERMO JUNCTIONS.** See Instruments, Laboratory Standard.

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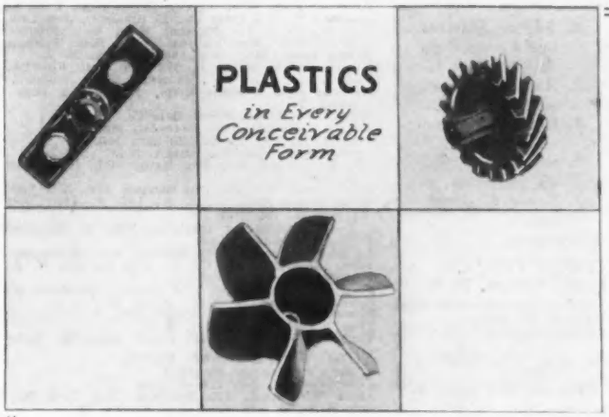
Baker & Co., Inc., 54 Austin, Newark, N. J.
Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
General Plate Co., Attleboro, Mass.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 29 Commercial, Newark, N. J.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

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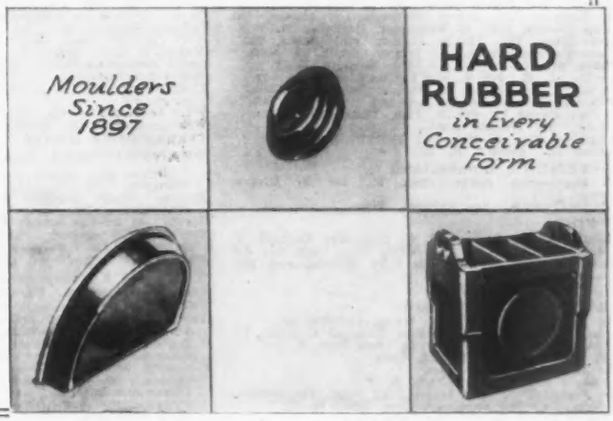

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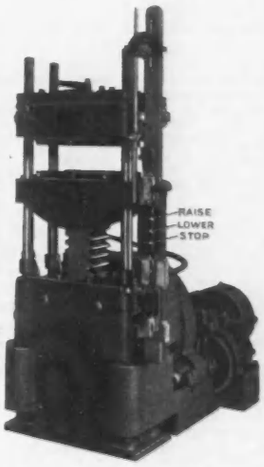


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Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston.
Crambiett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 6902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd. Chicago, Ill.
Freas Thermo-Electric Co., 1206 S. Grove, Irvington, N. J.
Globe Mfg. Co., Battle Creek, Mich.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Klixon. See Westinghouse Electric & Mfg. Co.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Savutime Devices, Inc., 68 Manhattan, Rochester, N. Y.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermolectric. See Bishop & Babcock Sales Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 430 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

## TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 230 N. Morgan, Chicago, Ill.

**TIME SWITCHES.** See Switches, Time.

## TIN FOIL

Lehmaier, Schwartz & Co., 521 W. 25th, New York, N. Y.
United States Foil Co., 30th & Grand Sts., Louisville, Ky.

**TINNING TANKS, WIRE.** See Wire Manufacturing Machines.

**TINSEL.** See Wire, Insulated.

## TINSEL, Cord and Thread

Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Diamond Braiding Mills, Chicago Heights, Chicago, Ill.
Frank & Co., M. J., 15 W. 39th St., New York, N. Y.
General Electric Co., Bridgeport, Conn.
Hy-Sil Mfg. Co., Revere, Mass.
Kilo Co., 2 E. 23rd, New York, N. Y.
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia.
Lees Mfg. Co., 220 Broadway, New York, N. Y.
Montgomery Co., J. R., Windsor Locks, Conn.
Rockbestos Products Corp., 365 Nicoll, New Haven, Conn.
Springfield Wire & Tinsel Co., Springfield, Mass.
Taft Co., R. C., 174 N. Franklin, Chicago, Ill.

## TIPS, Cord

Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S. 180 S. Water, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

**TOOLS, Commutator Slotting.** See Slotting Machines & Tools, Commutator.

## TOOLS, Coil Tamping

Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.

## TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

## TOOLS, Storage Battery

Battery Euipment & Supply Co., 7530 Greenwood Ave., Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Beam. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Type.)
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
General Elec. Co., Schenectady. (Lead Burning Outfits.)
Heet-A-Knife. See Op-al Elec. & Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 502 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

## TORCHES AND FURNACES

Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Weeber Co., 261 Franklin, Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Staysalite. See Klein & Sons, Mathias.

**TORPEDO Cord.** See Twine.

**TORSION BALANCES.** See Instruments, Laboratory Standard

## TRANSFORMERS

Radio. See Radio Circuit Components.




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3. D. C. Battery Charging Equipment.
4. Field Rheostats.
5. Laboratory Resistors and Rheostats.
6. Motor Starters and Controllers A. C. and D. C.
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Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Intermediate Voltage.

## TRANSFORMERS, Low and Intermediate Voltage

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American Transformer Co., Newark, N. J.
Campbell Elec. Mfg. Co., Lynn, Mass.
Concourse Electric Co., 294 E. 137th, New York, N. Y.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Jefferson Electric Co., 1500 S. Laflin, Chicago, Ill.
K-W Ignition Corp., 2811 Chester Ave., Cleveland, Ohio.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York
Sorgel Electric Co., 56 W. Water, Milwaukee, Wis.
Standard Transformer Co., Warren, O.
Uptigraff Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Webster Electric Co., Racine, Wis.

**TRANSMISSION DRIVES.** See Chain, Transmission.

## TRANSMITTERS, Power

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Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

**TROUBLE FINDERS.** See Instruments, Portable and Switchboard; also Testers, Coil.

**TRUCKS, Armature.** See Lifts, Armature.

## TRUCKS, Factory Steel

Angle Steel Stool Co., Plainwell, Mich.

**TRUING** Devices, Commutator. See Tools, Commutator.

**TUBE** (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Aluminum. See Aluminum.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Nickel. See Tubing, Brass & Copper.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Porcelain. See Porcelain.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric

## TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10619 Berea Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Paper Tube Co., 1718 N. Damen Ave., Chicago, Ill.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

## TUBING, Brass and Copper

American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
Baltimore Tube Co., 1301 Wicomico, Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 84 Lafayette, New York
Cook, Dunbar Smith Co., 85 Sprague, Providence, R. I.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 820 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Michigan Copper & Brass Co., Div. of Revere Copper & Brass, 5851 Jefferson Ave., Detroit, Mich.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
National Elec. Products Corp., Pittsburgh, Pa.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Div. of Revere Copper & Brass, Inc., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Seovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa. (also Nickel)
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

## TUBING, Flexible Metallic

(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Hose Co., Waterbury, Conn.




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American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Auto-Brassflex. See National Metal Elec. Products Corp.
Auto-Steelflex. See National Metal Elec. Products Corp.
Breese Corp., Inc., 34 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Flexo Spring Mfg. Inc., 34 South First, Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

## TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Canfield Rubber Co., 702 Railroad Ave., Bridgeport, Conn.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Rubber-Vac. See Eisler Electric Corp.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

## TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Wire Corp., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

**TURNED-UP BOXES AND CABINETS.** See Cabinets, Sheet Steel.

**TURNING TOOLS, COMMUTATOR.** See Tools, Commutator Truing.

## TWINE, Armature Winding; Torpedo Cord

Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

**UNDERCUTTERS, Mica.** See Slotting Machines & Tools Commutator.

**UNITS, Refrigerator Condenser.** See Condenser Units, Refrigerator.

## UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Cairod. See Edison Elec. Appliance Co.
Chromalox. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 83 Holten, Danvers, Mass.
Daric Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Dur-ristor. See Cutler-Hammer, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Edgerest. See Industrial Controller Div.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5618 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Erie Resistor Corp., 644 W. Twelfth, Erie, Pa.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Willow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., 397 West Main, Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa. (Radio Resistance.)
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Lauts Mfg. Co., 345 N. J. R. R. Ave., Newark, N. J.
Louthan Mfg. Co., East Liverpool, O.
Marks Elec. Co., Hiram, 804 Woodward Ave., Detroit, Mich.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 20th, Indianapolis, Ind.
Parker & Co., T. C., 407 Bulletin Bldg., Philadelphia, Pa.
Poloron Elec. Mfg. Co., 26 Waverly Pl., New York, N. Y.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Sesco. See Automatic Electric Heater Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N. Y.
Vitrohm. See Ward Leonard Elec. Co.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.

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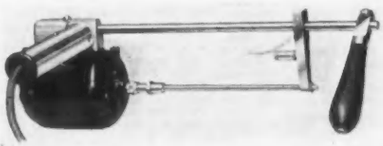

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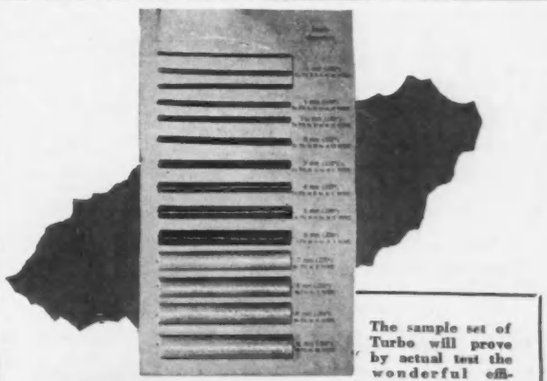

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Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 7530 Thomas Blvd., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.

**VACUUM CLEANER BAGS.** See Bags, Vacuum Cleaner.

**VACUUM DRYING & IMPREGNATING OVENS.** See Ovens, Industrial.

**VACUUM PUMPS.** See Pumps, Vacuum.

## VALVES, Electrically Operated

Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Crane Co., 836 Michigan Ave., S., Chicago, Ill.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electric Steam Radiator Co., 513 Stewart, Seattle, Wash.
Electric-Valve Mfg. Co., 68 Murray, New York, N. Y.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Michigan Metal Products Co., Battle Creek, Mich.
Nacco Mfg. Co., 1482 Clara Ave., St. Louis, Mo.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Sentinel. See Electric Steam Radiator Co.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teeple Co., L. B., 540 E. Ninth, Portland, Ore. (Gas.)
Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Zeco. See Zisch Engineering Corp.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

**VARNISH.** See Paint, Varnish, Lacquer.

**VARNISHED TAPE.** See Tape, Varnished Fabric.

**VARNISHED TUBING.** See Tubing, Varnished Fabric.

**VOLT BOXES.** See Instruments, Laboratory Standard.

**VOLTMETERS.** See Instruments.

**VULCANITE.** See Rubber, Hard.

## VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works Co., Akron, Ohio.

**WASHERS, FIBRE.** See Fibre.

## WASHERS, Leather

Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

## WASHERS, Lock

Hobbs Mfg. Co., Worcester, Mass.
Keystone. See Positive Lock Washer Co.
National Lock Washer Co., Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J.
Shakeproof Lockwasher Co., 2517 N. Keeler Ave., Chicago.
St. Louis Malleable Casting Co., 7701 N. Conduit Ave., St. Louis, Mo.

## WASHERS, Metallic

Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nut Mfg. Co., 2513 Culleton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.

**WATTMETERS.** See Instruments.

## WAX AND COMPOUNDS

Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ackurate Rubber Co., 25 Beaver, New York, N. Y. W . . .
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.... S . .
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... C
Blwax Corp., 208 S. La Salle, Chicago, Ill.... W S . .
Black Nego. See Williams Co., F. M.
Brand & Co., William, 268 Fourth Ave., New York, N. Y. ..... W . . .
Bulls-Eye. See Zinsser & Co.
Cabielene. See Vacuum Oil Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S . .
Cerowax. See Vacuum Oil Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston.... . . . C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... W S . .
Dolph Co., John C., 168 Emmet, Newark, N. J. W . . .
Di Electric Puttie. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn..... W . . .
Geoge Co., P. D., St. Louis..... W . . .
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O..... W S . .
Golde Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., Div. of General Cable Corp., 5133 Wesson Ave., Detroit... W . . .
Hercules Powder Co., 975 Market, Wilmington, Del. (Wood Rosin) ..... S . .
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York..... W . . .
Insulation. See Vacuum Oil Co.
Knox & Morse Co., 80 Freeport, Boston, Mass..... W S . .
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind..... . . . C
Mineralac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W . . .
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W . . .
National War Co., 189 W. Madison, Chicago, Ill. . . S . .
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. ..... W . . .
Sherwin-Williams Co., Cleveland, O..... W . . C
Standard Varnish Wks., 433 4th Av., New York.. W . . .
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W S . .
Star Porcelain Co., Trenton, N. J..... W . . C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Indiana Trust Bldg., Providence, R. I.



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Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. ..... W S . .
Vacuum Oil Co., 61 Broadway, New York, N. Y. W . . .
Warner-Quinlan Co., 2 Park Ave., New York, N. Y. . . . . C
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. ..... S . .
Williams Co., F. M., 1233 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y..... W . . .

**WEDGE DRIVERS.** See Tools, Commutator.

**WELDS, Lamp Lead-in.** See Filaments, Incandescent

## WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme Elec. Welder Co., 1850 W. Fulton, Chicago, Ill.
A. K. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Co., Inc., 726 Washington, Buffalo
Almanc. See Allan Mfg. & Welding Co., Inc.
Alternare. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Ames Co., 115 Ninth, Brooklyn, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Elsler Electric Corp., 756 S. 13th, Newark, N. J.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Fusion Welding Corp., 10257 Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Hansen. See Northwestern Mfg. Co.
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Cott Rd. and Kirby Ave., Cleveland.
Lundy Co., E. A., Fulton Bldg., Pittsburgh, Pa.
McAdams Co., J. C., New Britain, Conn.
Nigg Engineering Corp., Second St. & Covina Blvd., Covina, Cal.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Quasi-Arc, Inc., 11 W. 42nd St., New York, N. Y.
Rhason Mfg. Co., 217 45th, Union City, N. J.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Sellars Arc Welder Co., 1200 Fourth Ave., Seattle, Wash.
Senecs Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., 2567 W. Grand Blvd., Detroit,
Taylor-Winfield Corp., Mahoning Ave., Warren, O.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Toledo. See Thomson-Gibb Elec. Welding Co.
Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Thomson-Gibb Elec. Welding Co.

**WHEATSTONE BRIDGES.** See Instruments, Laboratory Standard.

## WICKS, Lubricating

Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.

## WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

## WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1830 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 107 Colden, Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Herald Electric Co., 29 East End Ave., New York, N. Y.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., 271 Vinewood Ave., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Co., Frank, 253 A St., Boston, Mass.
Segur. See Electric Service Supplies Co.



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Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
Superior. See Armature Coil Equipment Co.

## WINDING MACHINES, Induction Coil

Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Conran, Frederick M., 107 Colden, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 747 65th, Brooklyn, N. Y.
Weehawken Engineering Co., 543 Gregory Ave., Weehawken, N. J.

**WINDINGS.** See Coils, Finished.

## WINDOW SHADES, Factory

Athey Co., 6142 West 65th St., Chicago, Ill.

**WIRE (Cable) (Cord), Aluminum.** See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Lamp & Tube Filament. See Filaments, Incandescent Lamp.
Magnet. See Wire, Insulated.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Strippers.
Strippers. See Strippers.
Tungsten. See Filament, Incandescent Lamp.

## WIRE, Bare

Armature Banding .....See B
Copper Wire .....See C
Iron Wire .....See S
Phosphor Bronze .....See B
Radio Bus Wire .....See C
Resistance Wire .....See R
Steel Wire .....See S
Acme. See Alloy Metal Wire Co.
Alpha Wire Corp., 525 Broadway, New York.. C R . .
Auvance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa..... C R . .
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C R . .
American Electrical Works (Phillipsdale), Providence, R. I. ..... C . . .
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C . . S
American Steel & Wire Co., 208 S. La Salle,
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. ..... C . . .
Anylite Elec. Co., Fort Wayne, Ind..... C . . .
Ballast. See Gilby Wire Co.
Baltimore Copper Mills, Div. of Revere Copper & Brass, Inc., Baltimore, Md. ..... C . . .
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C . . .
Belden Mfg. Co., 4633 W. Van Buren, Chicago... C . . S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass..... R . .
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn..... C . . .
Calido. See Driver Harris Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C . . .
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa..... C . . S
Cornish Wire Co., 30 Church, New York, N. Y.. C . . .
Corwico. See Cornish Wire Co.
Crape. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C . . .
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 36 E. 30th, New York, N. Y... C . . .
Detroit Insulated Wire Co., Detroit, Mich..... C . . .
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J..... R . .
Electron. See Bassett Metal Goods Co.
Excellcier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.. . . . .
Gilby Wire Co., Riverside Ave., Newark, N. J.... R . .
Goldmark Co., James, 83 Warren, New York.. C . . .
Hope Webbing Co., 1005 Main, Pawtucket, R. I. (Braided Wire Tape) ..... C . . .
Hoskins Mfg. Co., 4435 Lawton Ave., Detroit, Mich. ..... R . .
Hudson Wire Co., Ossining, N. Y..... C R . .
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C . . S
Indiana Steel & Wire Co., Muncie Ind. ..... . . . S
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C . . .
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. ..... R . .
Nehring Electrical Works, De Kalb, Ill. ..... C . . .
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn..... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Div. of General Cable Corp., Pawtucket, R. I. ..... C . . .
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C . . .
Race. See Rome Wire Co.
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C . . .
Rice Co., A. H., Pittsfield, Mass. ..... C . . .
Roebling's Sons Co., John A., Trenton, N. J..... C . . S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C . . .
Ross Wire Co., 69 Bath, Providence, R. I..... C . . .
Senera Wire & Mfg. Co., Fostoria, O. ..... S
Silicrimp. See Valley Narrow Fabric Co.
Silectron. See Standard Alloy Wire Co.
Solar. See Gilby Wire Co.
Spargo Wire Co., J. A., Rome N. Y..... C . . .
Standard Alloy Wire Co., Elizabeth, N. J..... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C . . .
Super-Insulated Wire Co., Plymouth, Mass. ..... C . . .
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C . . .

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Copperweld Steel Co., Glassport, Pa.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
WIRE SOLDER. See Solder, Bar and Wire.

## WIRE DRAWING MACHINES

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American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Conn.

## WIRE FORMING MACHINE

Seifert, E. R., 315 E. Washington, Syracuse, N. Y.

## WIRE, Insulated

KEY

Annunciator, Office, Bell Wire....See A
Asbestos Covered Heater Cord.....See h
Asbestos Covered Magnet Wire....See M
Enameled Magnet Wire .....See M
Fixture Wire .....See B
Flexible Reinforced Heavy Duty Cord .....See F
Heater Cord .....See H
Ignition Cable .....See R
Lamp Cord .....See R
Magnet Wire .....See M
Rubber Covered Wire & Cable..See R
Stove Wire .....See H
Telephone Cord .....See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R . . . . . .
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn. Enameled Silk, Cotton ..... . . . . M
Amelectric. See American Elec.
American Braiding Co., Holyoke, Mass. R . . . . . .
American Brand. See American Insulated Wire & Cable Co.
American Copper Products Corp., 233 Broadway, New York, N. Y..... . . . . .
American Electrical Works (Philipsdale), Providence, R. I..... . . . . M
American Enameled Magnet Wire Co., Muskegon, Mich. ..... . . . . M
American Insulated Wire & Cable Co. Div. of General Cable Co., 854 W. 21st, Chicago, Ill ..... . . . . M
American Insulated Wire Corp., 45 Baker, Providence, R. I. ..... R F . . A T . .
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerize. See American Steel.
Amparak. See American Steel.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y..... R F . . A . . M
Anaconda Wire & Cable Co., Maring Wire Branch, Muskegon, Mich. (Silk, Enamel) . . . . . M
Ansonia Electrical Co., Ansonia, Conn. Silk, Cotton, Enameled..... . . . . A . . M
Armorlokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan) 26 Boston . . . . . B . . . . . .
Belden Mfg. Co., 4633 W. Van Buren Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y..... R F . . . . . .
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H . . . . .
Bradford, Kyle & Co., Plymouth, Mass. . . . . M
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
Collyer Insulated Wire Co., Pawtucket.. R F H . . . . .
Colorbestos. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R . . . . . T . .
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Braid, Inc., Providence, R. I..... H . . . . .
Crescent Ins. Wire & Cable Co., Trenton R F H A T M
Darow Mfg. Co., 36 E. 20th, New York. R . . . . . .
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T . .
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R . . . . . T . .
Diamond Braiding Mills, Chicago Heights R F H . . . . M
Di-Noburn. See Diamond Braiding Mill.
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R . . H . . . . .
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. . . . . M
Ducatto. See Dudlo Mfg. Co.
Durabilt. See Anaconda Wire & Cable Co.
Duracord. See Anaconda Wire & Cable Co.
Durawire. See Anaconda Wire & Cable Co.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R . . . . . .
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Enterite. See Rome Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. ..... F . . . . . .
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. . . . . T . .
GE-Flex. See General Elec. Co.
General Asbestos & Rubber Co., Charleston, S. C. ..... H . . . . .
General Elec. Co., Merchandise Dept., Y322 Bridgeport, Conn ..... R F H . . . M
Giant. See Collyer Insulated Wire.
Globe Insulated Wire, 148 Old Colony Ave., Wollaston, Mass. ..... R . . . . . .
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet ..... A . . M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R . . . . . T . .
Grimshaw. See New York Ins.
Hatex. See Hatfield Rubber Wks.
Hatfield Rubber Wks., Inc., Hillside, N. J. ..... R F H . . T . .
Hazacord. See Hazard Insulated Wire Works.
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa.... R F . . A . . M
Holyoke Co., 621 Broadway, New York.. R . . . . A . . M
Inca Mfg. Co., Fort Wayne, Ind..... . . . . M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H . . . . .
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R . . . . . T M
Kilo, Co., 2 E. 23d, New York..... . . . . T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. ..... . . . . T . .
Lowell Insulated Wire Co., Lowell, Mass. R F H . . . . .
Liberty. See Nat. Metal Molding
Loxwood. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass..... R . . . . . T . .
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T . .
Massachusetts Elec. Mfg. Co., West Lynn, Mass. ..... . . . . M
Montgomery Co., J. R., Windsor Locks, Conn. ..... . . . . T . .
National Elec. Products Corp., Pittsburgh. R F H A T M
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. ..... R . . . . . .
New England Elec. Wks., Lisbon, N. H.. R . . . . . .
N. E. See New England Elec. Wks.
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R . . . . . .
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co. Also Okocord. See Okonite Co.
Okonite Co., Passaic, N. J..... R . . . . . .
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F . . . . . .
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa..... . . . H A T . .
Phillips Wire Co., Div. of General Cable Corp., Pawtucket, R. I..... R . . . . . .
Providence Insulated Wire Co., Providence R F H A . . .
Raven Core. See New York.
Reliance. See American Steel.
Revolute Wire Co., Hastings-on-Hudson, N. Y. ..... . . . . M
Rockbestos Products Corp., 365 Nicoll, New Haven, Conn. ..... R . . H . . T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Inc., Div. of General Cable Corp., Rome, N. Y..... . . . . M
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... R F H . . T M
Ross Wire Co., 69 Bath, Providence, R. I.. R . . . . . .
Romoxide. See Rome Wire Co.
Ruffcoat. See Rome Wire Co.
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill..... . . . . T . .
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H . . . . .
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R . . . . . .
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Shield. See Ansonia Elec'l Co.
Simplex Wire & Cable Co., 201 Devonshire, Boston, Mass. ..... R F H . . T . .
Southern States Cable Co., Div. of General Cable Corp., Mobile, Ala..... . . . . M
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. . . . . H . . . . .
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T . .
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R . . . . . .
Strand & Sweet Mfg. Co., Winsted, Conn. . . . . M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn..... R . . . . . .
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F . . . . . .
United States Rubber Co., 1790 Broadway, New York, N. Y..... R . . H A T .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. ..... . . . . M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H . . T . .
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y..... R . . H . . . . M

## WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines .....See A
Braiding Machines .....See B
Bunching Machines .....See S
Covering Machines .....See I
Insulating Machines .....See I
Insulation Straining Machines.....See I
Measuring Machines .....See M

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Park Cabling Machines.....See A
Saturating Tanks .....See F
Spooling Machines .....See U
Stranding Machines .....See S
Tinning Tanks .....See F
Winding Reels .....See U

Adamson Machine Co., Akron, Ohio.. I A . . . . . .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A . . . S U F
Breguet. See American Insulating
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. ..... . . . . M . . U . .
Fidelity Machine Co., 3908 Frankford Ave., Philadelphia, Pa. ..... . . B . . . . . .
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I . . . . . U . .
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. . . . . M . . U . .
Nebuttco. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U . .
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass. ..... A . . . S U
Terkelsen Machine Co., Terkelson Bldg., Boston, Mass. ..... . . . . M . . . . .
Textile Machine Works, Reading, Pa. . . . . B . . . . . .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. ..... A . . . . . U F
Utility Mfg. Co., Cudahy, Wis..... I . . . . . .
Wardwell Braiding Machine Co., Central Falls, R. I. ..... B . . . . . .
Watson Machine Co., 74 Railroad Ave., Paterson, N. J. ..... I . . . . . .
Wire Machinery Corp. of Am., New Haven, Conn. ..... . . . . M S U . .
Weir. See Housatonic Machine

## WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

## WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Odan Ave. Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

## WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers

## WIRE WRAPPING MACHINES

Terkelsen Machine Co., Terkelsen Bldg., Boston, Mass.
WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.
WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

## YARN AND THREAD: Silk, Cotton, Asbestos

Albestos Corp., 21st & Godfrey Ave., (Germantown), Philadelphia, Pa.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
American Asbestos Co., Norristown, Pa.
American Glanzstopf Corp., 180 Madison Ave., New York.
Anchor Thread Co., Trenton (Grovesville), N. J.
Asbestos Fibre Spinning Co., North Wales, Pa.
Columbian Rope Co., Auburn, N. Y.
Commercial Rayon & Thread Co., 19 W. 21st, New York.
Fawcett, Inc., Hughes, 115 Franklin, New York, N. Y.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
Franklin Rayon Corp., 86 Crazy, Providence, R. I.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., Div. of General Cable Corp., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville Corp., New York, N. Y. (Asbestos.)
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 150 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkalip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

## ZINC

Horse Head. See New Jersey Zinc Co.
New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)
United Metals Selling Co., 25 Broadway, New York, N. Y.

## ZINCS AND COPPERS, Battery

Bunker Hill. See St. Joseph Lead Co.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., 160 Front, New York, N. Y.
St. Joseph Lead Co., 250 Park Ave., New York, N. Y.

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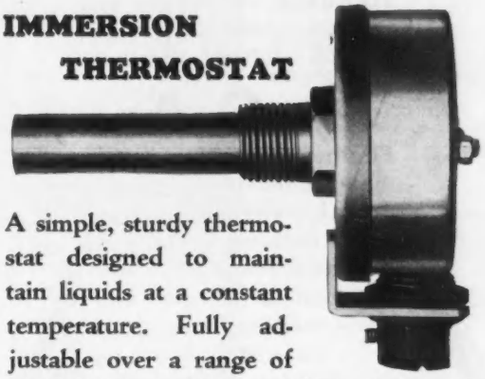

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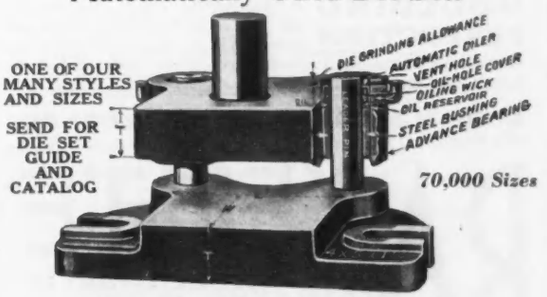


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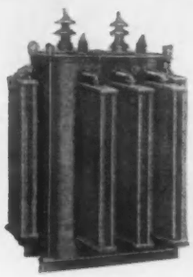
**1818 BROADWAY, ROCKFORD, ILLINOIS**

## *Pedigree Insulating Varnish*



## *Particularly Adaptable to the Electrical Industry*

THE most massive installation and most commonplace transformer alike depend for longevity on perfect dielectric protection.

Insulate your product with the tenacious armor of PEDIGREE Varnish or Compound, and you seal the surface for a long, serviceable life.

PEDIGREE insulating products do not yield to the action of heat, moisture, acids and alkalies and have the greatest wet and dry dielectric strength.

Samples of PEDIGREE insulating varnishes and compounds sent on request.

THE P. D. GEORGE COMPANY
Saint Louis Missouri

# LAVA Insulators

are unexcelled when incorporated in appliances requiring a fixed relation of their parts under all conditions.

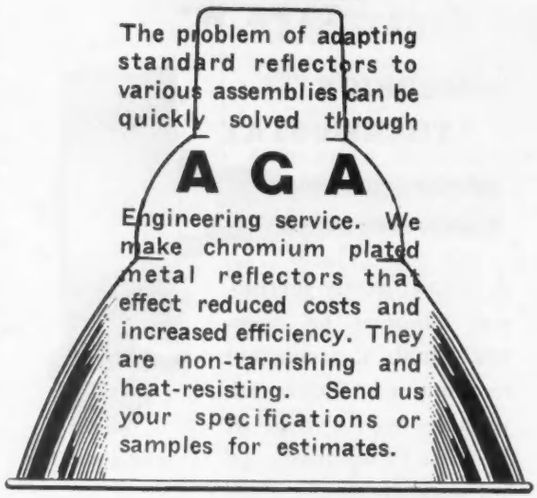
**AMERICAN LAVA CORPORATION**
1425 William St., Chattanooga, Tennessee
*Manufacturers of Heat Resistant Insulators*

# AGA

The problem of adapting standard reflectors to various assemblies can be quickly solved through

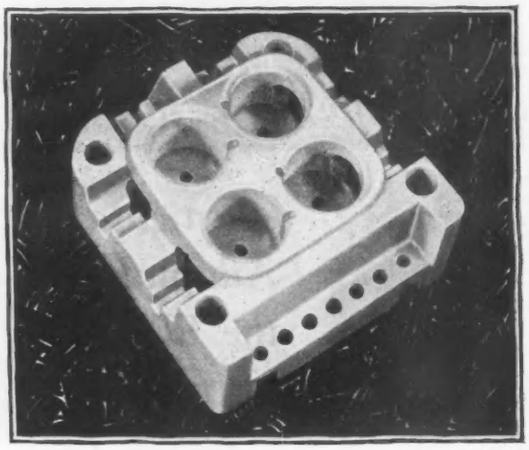
**A G A**

Engineering service. We make chromium plated metal reflectors that effect reduced costs and increased efficiency. They are non-tarnishing and heat-resisting. Send us your specifications or samples for estimates.



# REFLECTORS

**AGA AUTO LAMP CO., Inc.**
*Successors to Gray & Davis, Inc., Lamp Division*
**AMESBURY, MASS.**



# "Quality"
## *Special Porcelain*
## Refractory Tubes for Every Purpose

COLONIAL INSULATOR CO.
Akron, Ohio *Established 1894*

**MOULDING PERFECTION** If controlling every step in the job of moulding in Bakelite—from making the moulds to the actual moulding—can attain *perfection*, then Kuhn & Jacob has reached that goal.

**KUHN & JACOB MACHINE & TOOL CO.**
*502 Prospect Avenue* *Trenton, N. J.*

# BAKELITE
**—from mould to moulding—**
***every step controlled***

**UNUSUAL OPPORTUNITY**

is offered to responsible manufacturer with capital and equipment for precision quantity production of small stampings, small grindings and assembling facilities to produce patented and thoroughly developed *COMPACT ELECTRIC HAND TOOL MOTOR* of exceptional adaptability to labor saving devices with unlimited commercial possibilities. Developments on 4 highly meritorious adaptations completed. Distributors ready to absorb production for international distribution. Will consider partnership or guaranteed royalty proposition. No promoters.

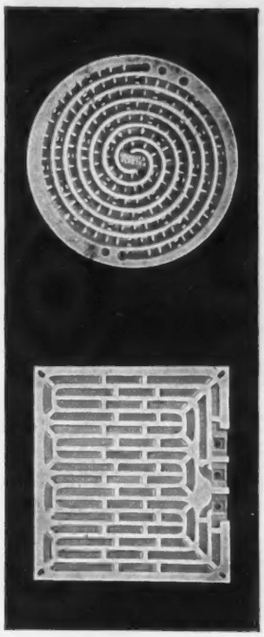
**Address Box 257, ELECTRICAL MANUFACTURING.**

Make use of
## GAGE STENCILS

**Gage Stencils are corrected daily, and the names of *all* your electrical buyers are on them. Use them for reliable, complete coverage.**

**THE GAGE PUBLISHING CO., INC.**
**461 Eighth Avenue, New York, N. Y.**

# REFRACTORIES



***made to maintain high standards demanded by electrical manufacturers***

Our REFRACTORIES conform to these requirements and are selected by manufacturers whose business success has been built on customer satisfaction.

They are continuously efficient under stress of high heat. They do not spall or spit-off under sudden temperature changes. There are no rough edges to injure the metallic resistor. Fine quality insures this. Reliability and dependability has made them first choice.

Our complete line includes REFRACTORIES for electric ranges and other household appliances; tubes and cores for all resistance windings (threaded or plain) refractory heating element supports for electric furnaces—and in addition we stand ready to assist you solve any and all refractory problems.

***Send us your specifications. Let us work with you.***

**The ELECTRICAL REFRACTORIES CO.,**
**East Palestine, Ohio**

# The Beacon

**guiding you straight to porcelain satisfaction**

**Porcelain buying is not a gamble or a matter of guess work if you specify or insist upon geting STAR Quality. Star Porcelain is real quality and yet the price is as low as some inferior kinds. Let STAR Quality guide you**

The STAR PORCELAIN COMPANY
TRENTON NEW JERSEY

# New Standards
## in dependable mouldings

NORTON MOULDINGS are constantly setting new standards for accuracy and durability in mouldings for the Electrical Industry. For:-

**1.** Each Norloc Moulded part is an exact duplicate of the original. One, one hundred, or one million . . . the first part is exactly like the last.

**2.** Norton, in 1929, made over fifteen million moulded parts for the Electrical Industry. We believe the experience gained in handling this enormous production well qualifies us to undertake your moulding requirements.

**3.** Norton experimental and engineering facilities are second to none. You are assured in advance of a sound solution of your moulding requirements at the lowest prices consistent with Norloc quality.

Years of experience in the solution of moulding problems for all types of industry places Norton Laboratories in a favorable position to help you secure the maximum service and satisfaction at the lowest possible prices.

Place Norton on your "Source of Supply" list for 1930. Watch the resulting economy all along the line. Send for complete data on your moulding requirements. Use coupon below or send engineering data.

NORTON LABORATORIES, Inc.
Division 82 LOCKPORT, N. Y.

CLIP and mail this coupon for samples of Norloc mouldings for the Electrical Industry. Or, better yet, send complete engineering data for quotations on your present or future moulding requirements.

*Individual*_____
*Firm Name*_____
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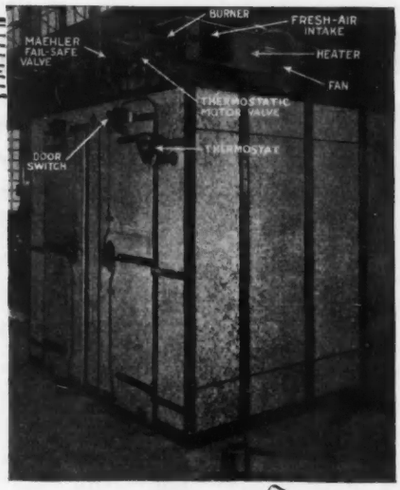
# Norloc

# Speed with Safety plus

Re-circulated convected heat—the basic principle of the Maehler-Universal Heater—offers the true solution to the baking and drying problem in the electrical industry.

Clean heated air, distributed through ducts to all parts of the oven, insures rapid and uniform baking. Explosive vapors from the process are passed back through the burner zone and incinerated. Automatic devices remove all other oven hazards, and give constant temperature control. Certainty of results makes the Maehler system highly economical for baking or drying armatures and coils, and many other difficult heating operations.




*Maehler cabinet oven equipped with Maehler-Universal Heater, installed overhead. Safety devices interlocked with fuel supply, fan relay and door switches. New type of gas burner gives 95% combustion efficiency.*

*This eight-page booklet, "Heat from Hazard," gives you complete facts about the Maehler-Universal system of industrial oven operation. Where shall we send your copy?*

THE PAUL MAEHLER CO.
2220 West Lake St. :: Chicago, Illinois
Universal Economy

# MAEHLER OVENS

Ready to Use
Needs only Heat

## ECONOMY

Kester for economy. Saves the time and labor of searching for, handling, and applying a separate flux. For every phase of industrial soldering, use Kester, the solder with the flux right in the core.

The Kester Engineers will gladly meet your particular soldering requirements with a special solder from our enormous line including 48,000 cored wire items. Write for particulars.

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4210 Wrightwood Ave., Chicago, Ill.
*Established 1899—Formerly Chicago Solder Co.*

KESTER FLUX-CORE SOLDER
ACID-CORE METAL MENDER
ROSIN-CORE
PASTE-CORE RADIO SOLDER

## TOYCO SPONGE RUBBER

*Also*

**Solid Soft Rubber Specialties**

To shock-proof and insulate all manner of Electrical equipment. Send blue prints for prices and full particulars.

*Dept. "W"*
The Toycraft Rubber Co., Ashland, Ohio

## Electrical Materials

TESTED FOR

Dielectric Strength
High Voltage Breakdown
Conductivity and Resistance
Chemical Composition
Mechanical Strength
Microscopic Structure
Wearing Qualities
Operating Characteristics

*A Written Report to Each Client*

**Electrical Testing Laboratories**
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## A New Binding Post You Can Manufacture

*on a license royalty basis. Covered by U. S. and Canadian patents.*

*Insulated. No holes to fish for. Insert wire in any position. Quick action. Holds tight.*

J. L. POLK, *Patentee*
41 Belle Avenue Troy, N. Y.

## A Phenolic Laminated Insulation

A product in which dielectric strength, non-absorption, acid resistance and other requirements for high efficiency meet the exacting standards of its producer—THE GENERAL ELECTRIC COMPANY—America's great institution in Electrical Manufacturing and Research.

DISTRIBUTOR TEXTOLITE LAMINATED

# Textolite Laminated

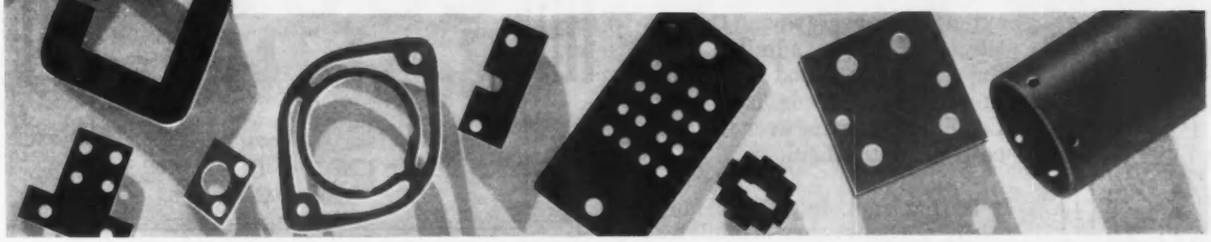
### VALUABLE SPECIFICATIONS *for* RADIO INSULATION

Our Engineers have prepared specifications covering the use of Phenolic Laminated Insulation in Radio Sets.

These specifications are the result of exhaustive laboratory experiments to determine the exact types and grades of TEXOLITE necessary to prevent loss of power and changes in operating characteristics due to humidity variations and other abnormal conditions. *Write for these specifications—they're "worth-while."*

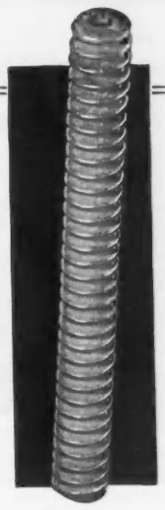
**ELECTRICAL INSULATION CORPORATION** 308 W. WASHINGTON ST. CHICAGO - ILLINOIS

DETROIT OFFICE—53 Marston Court MILWAUKEE OFFICE—114 Wisconsin Avenue



# Porcelava

**The best for Electric Heating Appliances**



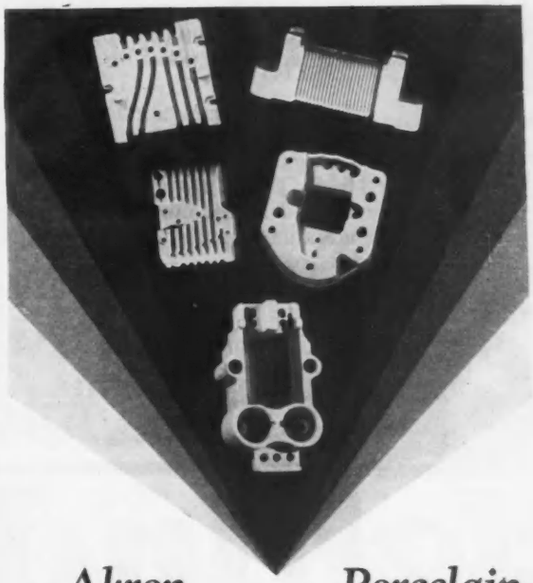
Our clay specialties, plain and threaded tubes, and Refractory Porcelain for Electric Heating Appliances are superior in every way; and "PORCELAVA" makes the best Pyrometer Insulation.

**Burgess & Company**

**East Liverpool, Ohio**

Factory at Wellsville, O.

Chicago Representative:
F. D. FARNAM & CO.
333 No. Wells St., Chicago, Ill.

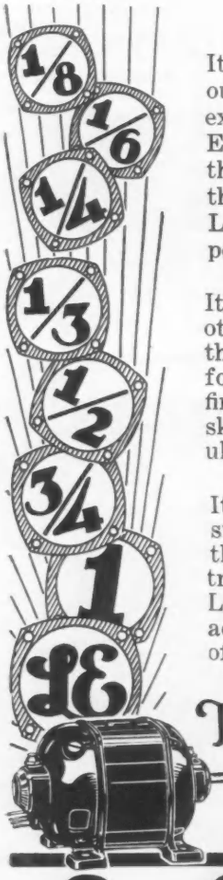


## *Akron Porcelain*

Well formed - - - Strong
Accurate - - - Good appearance
Reasonable Prices

THE AKRON PORCELAIN CO.
Akron, Ohio
*Formerly the Mogadore Insulator Company*

# Competition




It takes competition to bring out the best. Only by being extended do we grow. Leland Electric freely admits that there are other good motors on the market, recognizes that Leland Motors are ever in competition with them.

It is that fact, more than any other, perhaps, that stimulates the Leland personnel to strive for better and better designs, finer and finer materials, more skillful craftsmanship, and the ultimate in inspection.

It is our firm conviction that such competition is one of the things for which we should be truly grateful—otherwise The Leland Motor could never have advanced so far along the road of progress.

The Leland Electric Co.
Dayton, Ohio.
U. S. A.

# Leland
fractional horsepower
# Motors

**An Ordinary Wrench Can Wreck Your Reputation!**

When the user of your product takes his wrench and tightens up the housing to stop a leak around the revolving shaft—your good reputation is in danger! If he overloads the motor, or packs the joint so tight as to score the shaft—it's *your* fault!

And sooner or later he will probably do just that—unless your machine is Cooke Seal Ring equipped. For this is the only method of packing which is absolutely leak-proof. Revolving *with* the shaft instead of pressing *against* it, the Cooke Seal Ring is long wearing, almost frictionless, and economical in first cost, installation cost and upkeep. Let us show you why the Cooke Seal Ring should be on your machine, as it already is on a score of other varied machines—from pumps to dish washers.

# COOKE Seal Ring

46 North Green St.
Chicago, Ill.
Dept. W

# THE Automatic Heater

***That Equipment Engineers Have Long Awaited***

## IS HERE

An electric heater that heats process materials automatically . . . never overheats . . . requires no attention from workmen . . . a heater to meet the needs of modern high speed production.

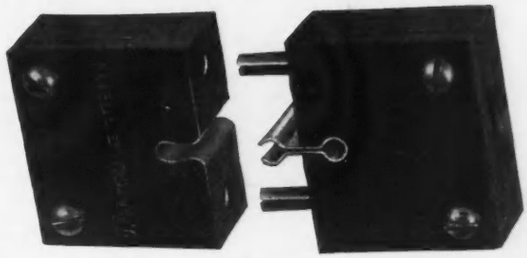
Heated outlet prevents "freezing" before delivery to point of use. Multiple wired heating circuits are automatically switched on and off as needed to maintain a constant temperature. Foot operated needle valve permits accurate control of pouring operations.

Heats any material up to 450° F. Standard sizes from one quart to 50 gallons. Special sizes up to 100 gallons. New applications being made daily.

Write for complete information.

BECKWITH MACHINE COMPANY
402 Chestnut St. Ravenna, Ohio

# Sta-Warm
AUTOMATIC ELECTRIC HEATERS



# New Feature

ON KLIEGL PIN-PLUG CONNECTORS

SPRING catch, added improvement to our regular two-poie 5- and 15-ampere connectors; snaps in place, holds two halves together with a "bull-dog" grip; especially suited for use where cables are exposed to stumbling feet and traveling vehicles; are exactly the same construction as our regular connectors of corresponding sizes—except substantial spring above illustrated is firmly embedded in male section of connector, and female half is provided with curved slot to receive the spring catch.

*Write for Bulletin No. 102*

**KLIEGL BROS**

UNIVERSAL ELECTRIC STAGE LIGHTING CO., INC.

321 WEST 50th STREET

NEW YORK, N.Y.

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# 2,500 tests an hour

Such is the speed with which an unskilled operator can check electrical parts with the aid of a

## RUBICON Rapid Testing Instrument

If you have a problem involving quantity testing of **resistances, heater coils, fuses, grid leaks, condensers—large or small, inductances, chokes, tranformers, vacuum tubes,** etc., we can save you both time and money.

Place your problem before us today

**RUBICON COMPANY**

*Makers of Precision Electrical Instruments*

**29 No. Sixth St., Philadelphia, Pa.**

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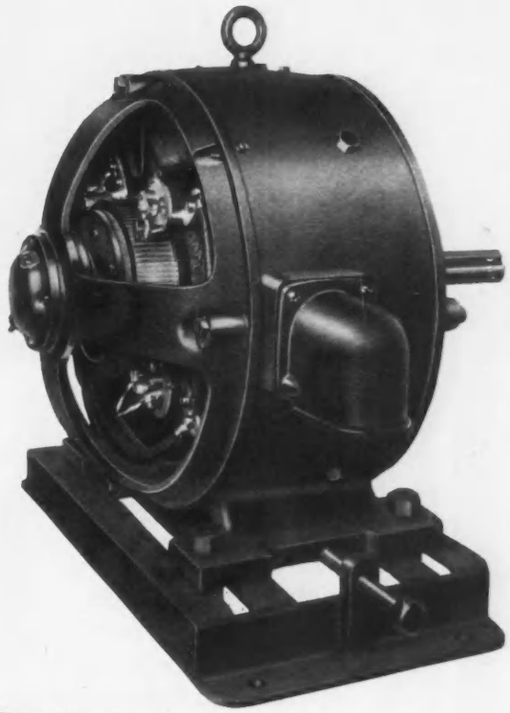

*first*

to make ball bearing motors in the U. S. A.

This fact establishes Electro Dynamic as pioneers in the development of friction-free, long-lived motors and generators that have proven their dependability in every known industry.

EDCO MOTORS

Quality for half a century!

# Can motor service be of *pre-* determined quantity?

That is a question Electro Dynamic answered years ago when our policy—to build motors wherein SERVICE began with the design—was adopted.

In every detail, from bearings to housing, is reflected out-of-the ordinary care in the selection of material and in workmanship.

There is an Electro Dynamic motor for every known motor application calling for from ½ to 1000 H.P. and each motor is built as carefully as the other. All types are provided with a large, roomy conduit box.

Make sure now of the receipt of our new bulletins now in course of preparation.

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**Alternating and Direct Current Motors and Generators**

**Bayonne, N. J.**

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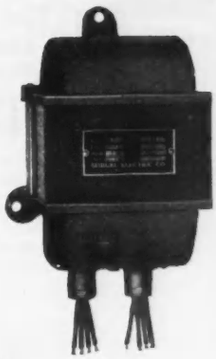
Gage
38th year

# First Cost—Last Cost

***No Upkeep***

When you install Sorgel ***Air-Cooled*** Transformers there are no "after-costs." Installations are economical, too, because no fireproof vaults or enclosures are required. No long runs necessary, because, being ***Air-Cooled,*** they can be installed easily and quickly right where the change of voltage is wanted, or any other convenient place ***inside of buildings.***



More practical and more efficient for ***lighting, portable tools, appliances, etc.***

***Approved by Underwriters***

Made in Sizes **1/4 to 50 KVA.**

**Single-phase, 2-phase and 3-phase**

**110, 220, 440, 550 Volt**

*Transformers Designed for Special Applications*

## SORGEL AIR-COOLED TRANSFORMERS

WITH CONDUIT CONNECTIONS

**SORGEL ELECTRIC CO.,** 89 W. Water St., Milwaukee, Wis.

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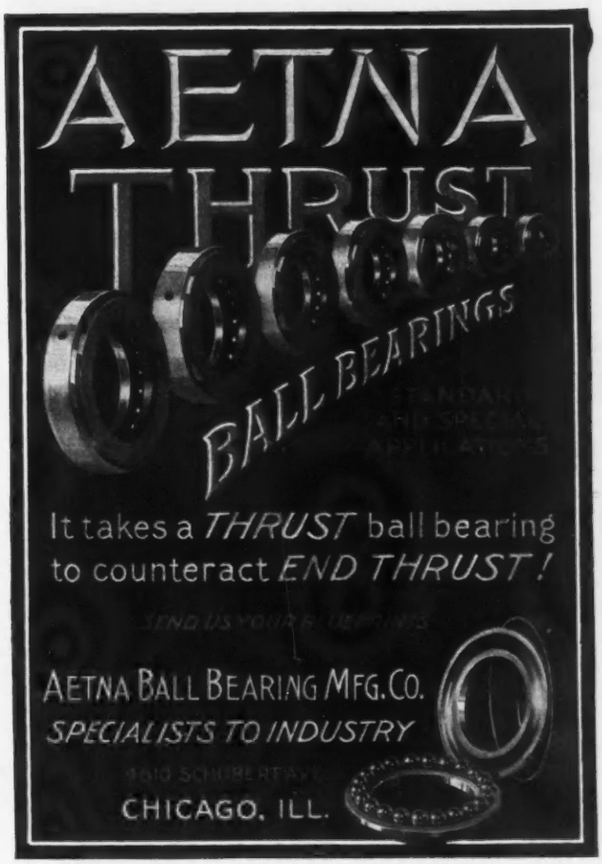


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# BUNKER HILL 99.99+% ZINC

**BUNKER HILL ZINC**

**In Die Casting Alloys**

10% Increased tensile strength

100% Increased elongation

50% Increased impact resistance

3 times longer steam-test life

**In Brass Making**

Greater percentage reduction by rolling between anneals.

Reduction in stress-corrosion cracking, due to low lead content.

Decreased brittleness, account minimum cadmium content.

**In Galvanizing**

More flexible coating, insured by minimum lead and cadmium content.

Increased corrosion protection account of purer zinc coating.

**As Ribbon Zinc**

Increased softness and ductility.

Greater corrosion resistance.

**In Nickel Silver**

Higher drawing and spinning qualities.

## The Remarkable New Die Casting Metal

**Every die caster who has longed for a better zinc to gain additional markets at no extra cost now has that opportunity pounding at his door.**

**Bunker Hill Zinc will make die castings that cut "creep" to the minimum and will not "hot short" in the making. Add to this the extra advantages of increased hardness, tensile strength, ductility and impact resistance and you'll realize there's no better die casting zinc today.**

**Bunker Hill's 99.99+% Purity varies less than 1/100th of 1% (month in and month out) and actually costs less to use than lower grades. Be sure it's "Bunker Hill," that's all.**

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## would you buy to nail a plank?

No question about it, is there? A staple, carpet tack or picture hook *obviously* would not be suited to the job at hand. One glance at a nail and you know its purpose; one glance at a nailing job, and you know which nail to use.

But *RESISTORS* are different. No passing glance can tell whether or not one is gauged *exactly* to perform its work with utmost efficiency. And no hasty inspection of the work it must do can accurately determine the Resistor required.

Resistors demand specialized knowledge and specialized handling.

# RESISTORS

**Samples made to your specifications mailed in 72 hours**

We have enlarged our factory—organized a special Rush Order Department—and within 72 hours after your specifications reach us, we can have finished samples on their way to you. By air mail, if you wish.

Whether your requirements can be met by one of our stock models, or special designing and production is necessary—we welcome an opportunity to tell you more about HH Service.

We do not claim to know *all* there is to be known about Resistors, but we believe that our experience coupled with your specifications will produce exactly the Resistor equipment you need. In fact, we have proved just that in serving many of the country's largest users.

**Our Catalog will prove helpful**

*Hardwick, Hindle Catalog No. 429 fills the need for a terse, compact Resistor manual. It shows styles, types of mountings—and gives clear Resistance Tables to simplify your calculating. May we send it?*

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Factory: 215 Emmet Street, Newark, N. J.

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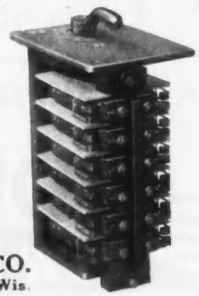
**The Most Complete Line of Squirrel Cage Multi-Speed Drum Controllers in the World**

## Skeleton Type Multi-Speed Drum Controllers

***Application.*** Skeleton type drums are designed to obtain compactness and ruggedness within a limited mounting space. The practice of "building in" a motor is extending to control equipment. The motor stator and rotor only are purchased; the machinery manufacturer supplying the main motor frame, shaft and bearings. The controller is also built into the machine casting, making a custom built design.



***Mounting Methods.*** The machine manufacturer cores a hole in the machine base for mounting the controller within the cavity or builds a box designed to conform to the contour lines of the machine. The cavity can be designed to hold as many controllers as required. The motorized machine is completely wired, ready to operate, with only the connections of the power circuit to be made when installing. Skeleton type drums furnished for 2, 3 and 4 speeds; constant torque, variable torque, and constant H. P.

**UNION ELECTRIC MFG. CO.**
934 Juneau Avenue, Milwaukee, Wis.
*Manufacturers of*
**Electric Motor Control Apparatus**

*Also Associated Manufacturer with, and Eastern Distributor for*
DIAMOND ◈ ELECTRICAL MFG. CO., *Los Angeles, Cal.*
*Magnetic Motor Control Apparatus*

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MANUFACTURERS OF ELECTRICAL PRODUCTS

## Motors

**Universal and induction type small fractional horsepower motors to meet all requirements for small motors. Send us your specifications. SIGNAL ELECTRIC MFG. CO.**
**Menominee, Michigan**
*Small Motor Specialists Since 1890.*

# ★NATIONAL★ RHEOSTATS

**FOR SMOOTH AND GRADUAL CONTROL OF—**

*Adjustable Resistance At Its Best*
SMALL IN SIZE
LIGHT IN WEIGHT
HIGH IN QUALITY
LOW IN PRICE
LONG IN LIFE

FINE CONTROL

MOTORS, GENERATORS
HEATERS, FILAMENTS
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No. 44

**Universal Motor for 110 Volts**

Suitable for phonograph drives, drink mixers, sewing machines, small Lathes, etc.

Battery motors and small generators our specialty. Send for circular.

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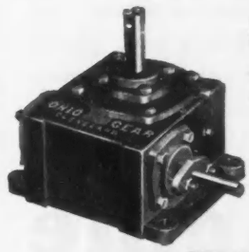
KENDRICK & DAVIS CO.
LEBANON, NEW HAMPSHIRE



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CATALOGUE 29-A

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**1336 East 179th Street, Cleveland, Ohio**
PITTSBURGH - INDIANAPOLIS - NEW YORK

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UNIFRAME
FOR MACHINE TOOLS
HIGH TORQUE,
TRAVERSE,
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SPECIALTY.

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SOLDER YOUR COMMUTATORS
With the
**"ALLATONCE"**
Commutator Soldering Machine at
**50 to 600 Per Hour**
Perfect Joints — No Injury to Insulation or Shafts—No Wasted Solder.

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Makers of Armature Winding Machines

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*D. C. MODEL ONE—the pioneer of all modern instruments for electrical measurement. They have stood the test of more than forty years of continuous service, proof of permanent accuracy and unparalleled quality.*

SWINGING round in the great cycle of centuries the world has progressed from ancient alchemy to positive science. The last phase of this metamorphosis has come with magic suddenness. In a single decade an era of dynamic development has sprung from a long succession of years of imperceptible change. And then, out of this static condition—like the unheralded appearance of a comet—there has come a veritable galaxy of scientific, industrial and commercial achievements of unusual brilliance.

Men are again building pyramids, but the original motive is lacking except for the same objective of permanence and security. No longer are mammoth monuments erected by the masses for the glory of a few. In the new order it is the few who are devoting their genius, and often without glory, to the building of memorials which will benefit all humanity. White power, electricity, has taken the place of black magic and the medium of visualization and control is electrical measurement. In this modern art the pioneer and master mind was Weston.

Today, the designs of his creation are the standards of the world. Weston instruments are perennially young. Time takes little toll of their exquisitely fashioned movements. Like the construction of the pyramids, they possess the secret of permanence.

Weston
PIONEERS SINCE 1888
INSTRUMENTS

WESTON ELECTRICAL INSTRUMENT CORP.
582 Frelinghuysen Avenue Newark, N. J.

# The *right* Spring costs no more

DEPENDABILITY of springs as a part of your product is of more importance to you than initial cost. All things considered, when a spring is essential to the operation of any device the best is the cheapest, regardless of first cost.

**GIBSON-SPRINGS**

COMPRESSION EXTENSION
TORSION FLAT
ANY MATERIAL OR QUANTITY
ANY STYLE OR SIZE
ALSO LIGHT STAMPINGS

**WM. D. GIBSON CO.**
1800 CLYBOURN AVE.
CHICAGO
ILL.

# COILS

Electro Magnet
Transformer
Inductance
Resistance
Ignition
Medical
Meter
Choke

WE make any type coil under the classifications of paper section, layer-wound and cotton interwoven. The many years we have devoted to the solution of coil problems have placed us in an advantageous position in this industry.

**Acme Products Co.**
Boston, Mass.
*Electro Magnet for Fire Alarm Systems*

M.&W.Co. 1876

**LACQUERS ENAMELS**

**? NEW ?**

**CLEAR CRYSTAL LACQUER**

An Entirely *NEW* and *DIFFERENT* DECORATION.

Not an Oil Baking finish.

It *AIR DRIES* in less than one hour.

Its Beautiful Crystal Formation surpasses all the usual Decorative finishes.

Ideal for Polished Metal.

*Your inquiry is invited*

**MAAS & WALDSTEIN COMPANY**
*Executive Offices and Plants:*
438 Riverside Ave., Newark, N. J.
Chicago Office and Warehouse: 1115 W. Washington Blvd.
Los Angeles Office and Warehouse: 1214 Venice Blvd.

# Off with the Old on with the NEW . . . Finish

MANY an American product of merit familiar to the public 15 or 20 years ago is still sold today, improved only with the durability and beauty of finish obtained with Zellac lacquer and lacquer enamels.

The significant point is this: Zellac, whether on new or old products, makes them distinctly modern with the latest types of finish and color combinations, increasing their salability.

We are helping our customers to hold positions of leadership with Zeller-made lacquers and lacquer enamels, in both our standardized Zellac grades and our grades specifically formulated to fit any special finishing requirement. Whenever the *old* is abandoned—whenever the *new* in beauty, color, durability and economy is needed—Zellac lacquers and lacquer enamels will help to place you first in sales.

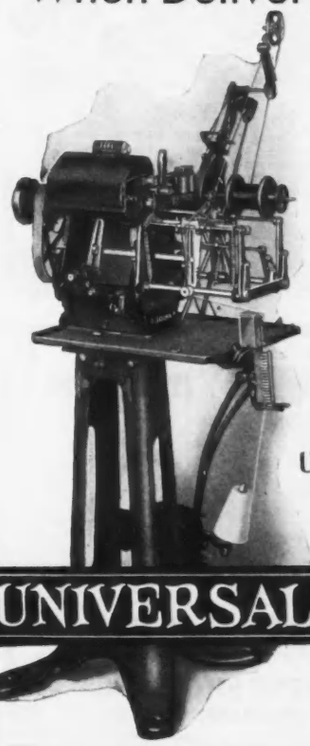
**ZELLER LACQUER MFG. CO., Inc.**
20 East 49th Street New York City

**ZELLAC**
FOR EVERY INDUSTRIAL PURPOSE

CHICAGO SAN FRANCISCO
LOS ANGELES SEATTLE
PORTLAND WICHITA

LEESONA

## When Delivery is at Stake



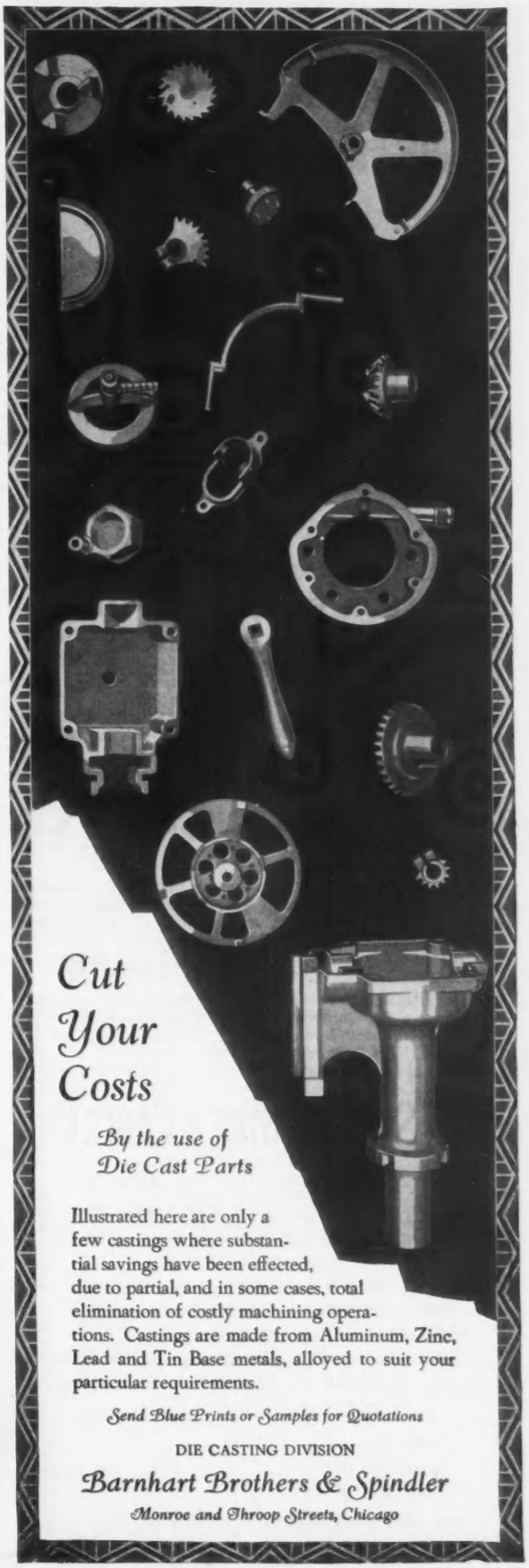
What a comfortable feeling it is, to know there will be no delay in your shipping schedule on account of coils. Enjoy this sense of security by installing a group of

*"Universal"* Coil Winding Machines

and insure dependable production of uniform coils, in your own plant, at surprisingly low cost

UNIVERSAL WINDING COMPANY
BOSTON

**UNIVERSAL WINDERS**



## *Cut Your Costs*

*By the use of Die Cast Parts*

Illustrated here are only a few castings where substantial savings have been effected, due to partial, and in some cases, total elimination of costly machining operations. Castings are made from Aluminum, Zinc, Lead and Tin Base metals, alloyed to suit your particular requirements.

*Send Blue Prints or Samples for Quotations*

DIE CASTING DIVISION
*Barnhart Brothers & Spindler*
*Monroe and Throop Streets, Chicago*

Protected by a sheath of
"Selenium Rubber"

# TIREX CORDS

FOR ELECTRICAL TOOLS AND APPLIANCES

To give the service it is capable of giving, a good portable electric tool or piece of apparatus should be serviced with a portable cord that will parallel the performance of the equipment to which it is attached.

TIREX Cords are made for portable electric tools and appliances. TIREX Portable Cord, type S, is a heavy duty cord, one that is made for particularly hard service. Type S J is a lighter type of cord intended for service where the more rugged type S is not required.

Both cords consist of rubber insulated conductors surrounded and protected by an outer sheath of carefully compounded "selenium rubber", an exclusive TIREX feature. The "selenium rubber" sheath will retain its toughness and wear-resisting qualities indefinitely.

TIREX is an added selling feature to every appliance. Cleanliness, freedom from dust and fraying, smooth outer surface, light weight and long life are TIREX advantages worth considering.

Send the coupon today.

SIMPLEX WIRE & CABLE Co
MANUFACTURERS
201 DEVONSHIRE ST., BOSTON
BRANCH SALES OFFICES
CHICAGO, 564 W. Monroe St. SAN FRANCISCO, 390 Fourth St.
NEW YORK, 1328 B'way CLEVELAND, 2019 Union Trust Bldg.
JACKSONVILLE, 1010 Barnett Nat'l Bank Bldg.

Simplex Wire & Cable Co.,
201 Devonshire St., Boston, Mass.
Gentlemen:
Please send data and sample of the following:
☐ TIREX S J Cord
☐ TIREX Cord, Type S
Company .....
Attention of .....
Street and No. .....
City and State .....



# CASE BROTHERS
INCORPORATED
Highland Park, Conn.

*Manufacturers of*

## Insulating Papers and Boards

## Press Boards

## Fuller Boards

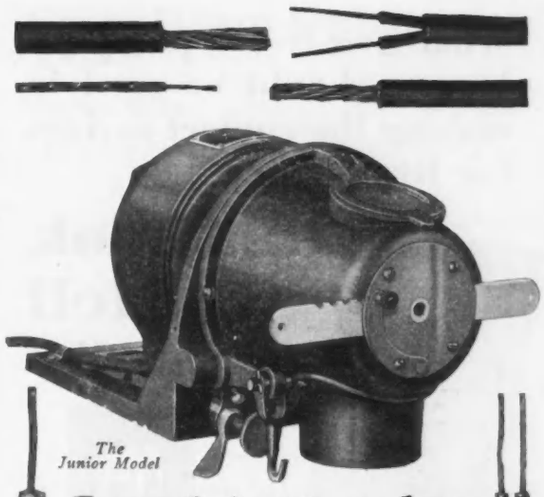
TRY US
and you will know why we are always busy on springs and screw machine parts. Quality and service our WATCHWORDS.
The Peck Spring Co.
Plainville, Conn.



# For Better Washers

OF BRASS, STEEL AND COPPER
Highest quality—Low prices
Write Us

MASS. MACHINE SHOP, INC.
BOSTON, MASS.



*The Junior Model*

**Saved $100 a day**

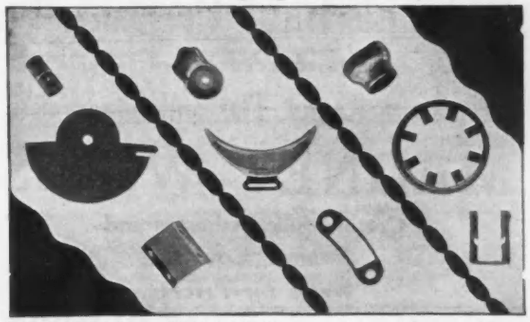
France Wire Stripper did this for one manufacturer who with five France machines stripped 50,000 wire ends in a day at a saving of $100.00.

You may test this new, money saving method in your own plant without obligation.

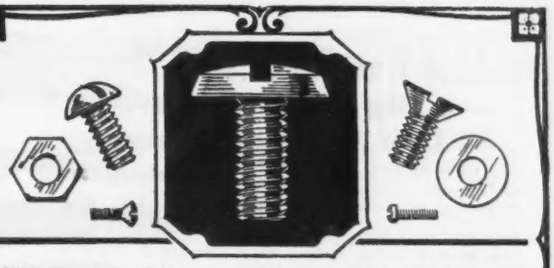
Write today for particulars. Get our bulletin.

**THE FRANCE MANUFACTURING CO.**
10306 BEREA RD., CLEVELAND, OHIO

**Small Metal Stampings Accurately Made**

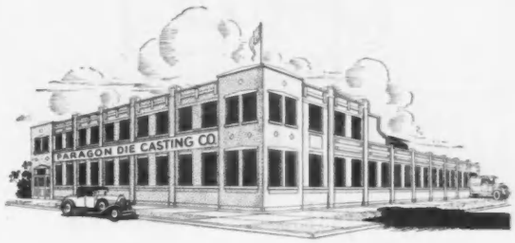


**PATTON-MacGUYER CO. — Providence, R. I.**



*All kinds of Electrical Screws carried in stock*
WRITE FOR PRICES
**NEW ENGLAND SCREW CO.**
DEPT. A
44 FARNSWORTH ST. BOSTON, MASS.

***Introducing Our New, Modern Plant***




**ready to produce for you accurately-made**

# PARAGON *Die Castings*

*of*

**Aluminum, Zinc, Tin or Lead Base**

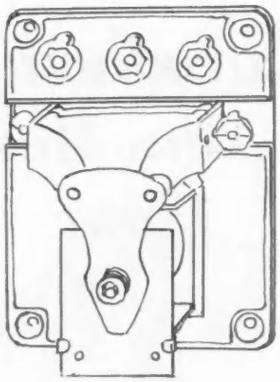
Officered and manned by a personnel that has *specialized,* for years, in die casting, PARAGON can do out-of-the-ordinary things for electrical manufacturers.

Everything in this new plant is modern. In the tool room, you'll find us making our own dies—every detail under control.

We are ready to submit quotations or work with you in solving any die-casting problem.

QUALITY PARAGON CAST DIE CASTINGS

**PARAGON DIE CASTING CO.**
**2701 N. Crawford Avenue, Chicago, Ill.**



It can't jar loose if it's locked with a

IN the mounting of relays and other electrical instruments it is well to think seriously of the quality of that seemingly insignificant item—the *lock washer.*

Hobbs Lock Washers are made of the best drawn steel, accurately dimensioned and carefully tempered that they might be depended upon to perform their special functions.

If you need lock washers of out-of-the-ordinary dimensions, we'd like to estimate on such production.

Hobbs Manufacturing Co.

Worcester - - - Massachusetts

*Not members of any combine.*

What grade of phosphor bronze should be used in making the contact springs for RELAYS

this book will tell you?

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THE PHOSPHOR BRONZE SMELTING CO.

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Comes in ingots, castings, rods, tubes, sheets, wire and ropes. The S Bearing Metal is unequalled in Bearing qualities and uniformity. Typical of our entire output.

Rome Electrical Company, Inc.

*Manufacturers of*

Twin, Round, Flat and Square

MAGNET WIRES

Cotton, Silk, Asbestos and Enamel Covered

*Write for Prices*

ROME NEW YORK

OUR

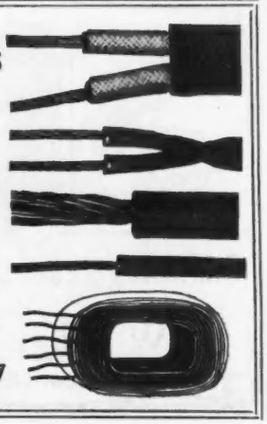
Insulated Wire Strippers

—A Big Help At Low Cost—

*Guaranteed by Trial*

We specialize on equipment for removing insulation from any wire or coil lead as required for any electrical connection.

One of our motor driven tools will save you time, money and trouble, and improve quality of work. Let us suggest the best equipment for your job. Descriptive bulletin and low prices mailed on request.



The Wire Stripper Company

507 Erie Bldg., Cleveland, Ohio

# ACME WIRE PRODUCTS

**Magnet Wire — All Insulations**
**Coils — Magnet Wire Wound**
**Varnished Insulations**
**Parvolt Filter and By Pass Condensers**

All Products Made to Recognized Commercial Standards including those of:
National Electric Mfrs. Assn.
Radio Manufacturers Assn.
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For 25 years manufacturers and suppliers to the largest and most discriminating users.

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# STANDARD

Nickel RESISTANCE Chromium WIRE

*A grade for every need*

We are manufacturers exclusively of high grade resistance alloys.

Standard Nickel-Chromium "A," "C," and "D" and Standard Novar cover all ordinary resistance requirements; for high grade electric cooking and heating appliances, industrial furnaces, rheostats and controllers, and electrical testing and measuring instruments, radio rheostats, resistors, thermo-couples, etc.

We make these and other resistance alloys in wire, ribbon or strip, either bare or insulated.

*Catalog and prices sent on request.*

**STANDARD ALLOY WIRE CO., *Elizabeth, N. J.***

*Standard Thermostatic Metal* — *Non-Rusting Thermostatic Metal*

A NEW combination of metals perfected to avoid the necessity of extra processing when contact with steam or water makes the use of other thermostatic metals impractical. Little loss of sensitivity. Made in all sizes and shapes for every application.

## Contact Points

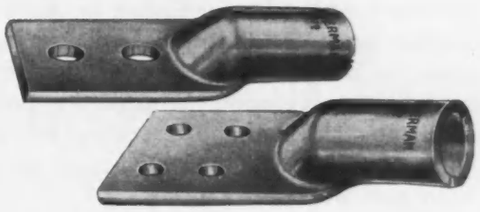
*in Platinum, Silver and Alloys*

## Interstate Products Corporation

*29 Commercial Street, Newark, N. J.*

# SHERMAN HEAVY DUTY SOLDERING LUGS

***A complete line,— correct in design, to meet every heavy duty requirement***



On the barrel of every one of these lugs is stamped the name SHERMAN. This is your guarantee that these lugs are made from the best grade of seamless copper tubing; that their dimensions are *consistently* accurate; that the contact surfaces are *flat* and that these lugs are *free from burrs.*

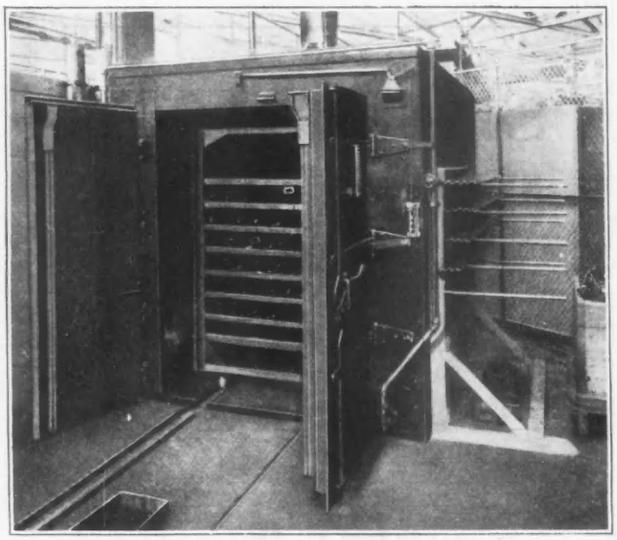
The ample production facilities of the SHERMAN plant and the policy of carrying heavy stocks provide for the filling of orders promptly.

This *standardized* line, being properly made, is also guaranteed to fit with exactness every heavy duty need.

***JOBBERS STOCK THEM***

## H. B. SHERMAN MFG. CO.

***Headquarters for All Terminals***
**Battle Creek, Mich.**



# Better Armatures . . . *at Less Cost*

THIS oven was recently installed in a plant which has for twenty years specialized in armature work. The executive in charge of production stated that they had never realized the possibilites for product uniformity and heating economy in armature baking until they checked the operating performance of this unit in their own plant and on their own work.

This is just one more demonstration of the satisfaction that invariably results from carefully engineered oven equipment. You too can reduce your operating cost and get better armatures when they are baked in an oven that is built to your own requirements.

**YOUNG BROTHERS COMPANY**
**6523 MACK AVENUE, DETROIT, MICHIGAN**

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OVENS FOR:

Core and Mold baking.
Low temperature heat treating.
Drying.
Japanning and enameling.
Electrical appliance baking.
Adapted to all methods of heating.

**INDUSTRIAL OVENS**

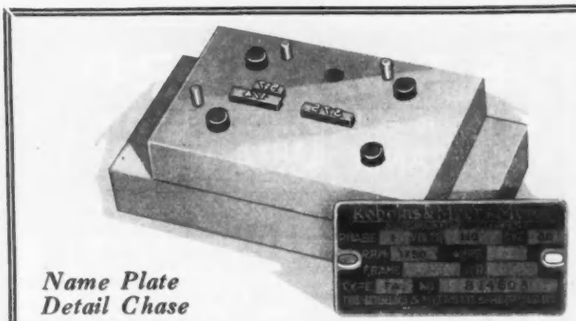
**Pure Zinc for Fuse Elements**

**Strip Zinc for Commercial Uses**

**Eyelets Standard & Special**

**Large Articles Made on Multiple Plunger Press**

**The Platt Bros. & Co.**
**Waterbury, Conn.**



*Name Plate Detail Chase*

Stamp all details in your name plates with one operation. Straight, uniform stamping improves appearance and stamping is done in a fraction of time.

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**GITS BROS.**

**Better Oilers**

*287 Styles & Sizes*

**GITS BROS MFG. CO.**
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**The electrical manufacturer's big market today is Electrical MAIN STREET. It engages in both installation and merchandising, and is the industry's most stable, sizable and potent buying factor. ELECTRICAL RECORD has more nearly reflected in its editorial pages the combined activities of this group, which has so accepted it as to give it the highest PAID and RETAINED circulation in the industry press. Cultivate this dominant market through ELECTRICAL RECORD, the proven, established medium for its permanent sales development.**

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# BEAD CHAIN *for* ELECTRIC FIXTURES

## Dependability

From the standpoint of quality, uniformity, and prompt delivery, dependability has made Bead Chain the standard of the industry.

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WILSON has the answer to any problem involving the use of these

# Thermostatic Metal

THE H. A. WILSON CO., NEWARK, N. J.
*Refiners and Workers of Platinum, Silver and Other Precious Metals*
***Chicago Office—5 S. Wabash Ave.***

M-R INSULATION M'F'G CO

*"Everything in Insulation"*

Compounds, Waxes and Paints
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# "Candy's Faultless"

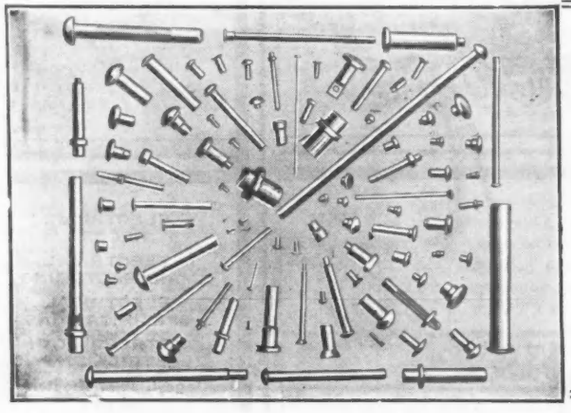
*(True to name)*

## WAXES INSULATING MATERIALS

*for* Rubber Covered and Weatherproof Wire, Coils, Condensers, Conduit, Wet and Dry Batteries, Wiring Devices, Sockets, Switchboards, etc. MATERIALS TO YOUR OWN SPECIFICATIONS OUR SPECIALTY. Compounds for Radio Parts.

***35 Years' Experience in Compounding***

CANDY & COMPANY, Inc.
35th and Maplewood Ave., Chicago, Ill.



# WHEN IN NEED OF

MACHINE SCREWS
MACHINE SCREW NUTS
SPECIAL STUDS
SPECIAL SCREWS

COMMUNICATE WITH
THE HOUSE OF SERVICE

THE PROGRESSIVE MANUFACTURING CO.
TORRINGTON, CONN.

We please those discriminating manufacturers who not only demand quality but service as well. Business goes where it is invited and remains where it is well treated. The illustration reveals a few only of the possibilities that are developed by the cold heading process.

# ELECTRITE

**A high grade fibre board for electrical insulation.**

**A material of quality possessing high tensile and dielectric strength.**

**Tested and approved by the Underwriters' Laboratories.**

*Pulp Products Department*

**WEST VIRGINIA PULP & PAPER COMPANY**

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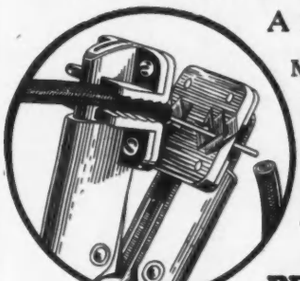
35 East Wacker Drive, Chicago, Ill.



## E-Z WIRE STRIPPER



A HANDY TOOL *for all* MANUFACTURERS

Here is a tool that will save you time and money, speed up production and lower your costs.

This inexpensive tool strips wire of 10 to 20 gauge 20 times faster than usual methods. Give it a trial on a money back guarantee. Thousands in use.

**PYRAMID PRODUCTS CO.**

2311 South State St., Chicago, U. S. A.



## Use Our Electric Tools

*For Screw Driving and Nut Setting*

in your production work and double your output. We manufacture several types—Portable and Bench Machines.

Send us your particular proposition.

These tools are adaptable for Radio and Speaker assembling, also electric plugs, switches, etc.

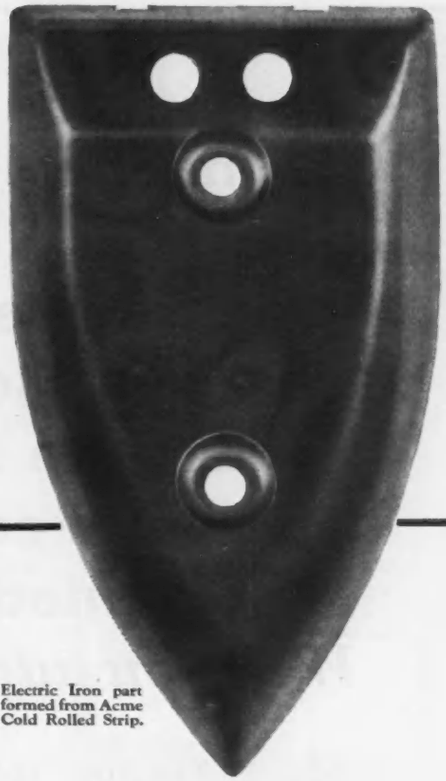
Will handle screws up to No. 10.

*Ask us for prices and circular matter.*

BENCH TOOL WITH PEDAL

Vim Electric Tool Co.
149 Broadway, New York City





Electric Iron part formed from Acme Cold Rolled Strip.

# ACME STRIP STEEL

*for*
*Electrical Manufacturing*

New Hot and Cold Mills now make Acme a reliable source of supply for a full range of sizes in hot and cold rolled strip steel, all tempers and finishes, including Electro Galvanized.

Furnished in long length coils or cut lengths, for stamping, forming and deep drawing.

We are in position to give you the best in quality and service. Let us figure with you on your requirements.

1880 **ACME STEEL COMPANY** 1930
OUR GOLDEN ANNIVERSARY

*Hot and Cold Rolled Strip Steel*

General Offices:
2832 Archer Avenue . . Chicago

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10

**A meeting will be held in March . . . every architect, electrical engineer, builder and electrical inspector interested in the specifying of electrical equipment will be represented . . . . . .**

***Will you address the meeting?***

The first issue of ELECTRICAL SPECIFICATIONS will gather an audience of the men who specify, influence and approve the ultimate choice of electrical equipment and products in all building construction. An unusual opportunity to cultivate these dominant groups and sell them on your products. A characteristically thorough Gage editorial service will help them in the adequate specification of electrical equipment. Meet them every month in the only *electrical* business paper reaching them.

**Electrical Specifications**

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*Publisher to the Electrical Industry Since 1892*

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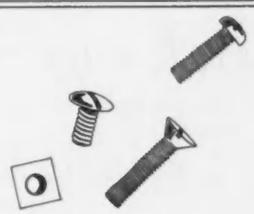


Eighty-one years ago we began the manufacture, in a small way, of SCREWS, NUTS and similar products.

Today the B. & J. plant, one of the most modern of its kind, supplies huge quantities of BOLTS, NUTS, MACHINE SCREWS and SCREW MACHINE PRODUCTS to the largest users as well as to those whose requirements are less.

Confidence in B. & J. products and service has created this ever growing business as the small order is just as important to us as the large one and our facilities insure all-time satisfaction.

Write today to B. & J.

**The Blake & Johnson Co.**

1497 Thomaston Ave.

**Waterville, Conn.**

SINCE 1849

**Coil Wire SPRINGS**

For all electrical and mechanical manufacturing purposes. All specifications as to quantity and quality are accurately met. Our prices are right and delivery prompt.

***Write for Catalog***

**ADVANCE SPRING & WIRE COMPANY**

**Carroll Ave. and Wood St. Chicago, Illinois**

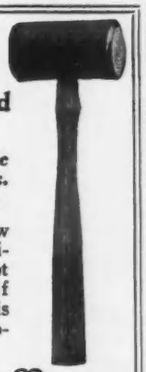
**Chicago Rawhide**

**Mallets and Rawhide-Faced Hammers**

***Used extensively in electric motor assembly and repair work.***

***Saves Battered-Up Motor Parts***

Will transmit an effective blow without damage to the most delicate surface. The blow is not more destructive to the tool itself than to the object to which it is applied—therefore, doubly economical.



**THE CHICAGO RAWHIDE MFG. CO.**

**1287 Elston Ave., Chicago, Ill.**

No. 48-30 All-Steel WORK BENCHES are here placed end-to-end and bolted together by moving bench legs to support ends of adjoining units. Also, SMALL PARTS RECEPTACLES on wall—a "special" job.

**Tuned to the Tempo of Today!**

PRODUCTION today is largely a matter of speed! Raw materials must pass from their sources of supply, after fabrication into the finished product, to the user in the shortest possible time.

Speed in production is dependent upon many things: Convenience—Saving of Space—Adaptability—Accessibility—Minimum Waste Motion—these are but a few.

You will find that ANGLE STEEL EQUIPMENT permits your plant to produce more and better work at lessened costs. Over 250 items from which to choose in Catalog "C-EM". Write for your copy.

The standard No. 48-30 WORK BENCH is fairly indicative of the usability and versatility of ANGLE STEEL EQUIPMENT. Built in 48, 60 or 72 inch widths; 30 inches deep; 34 inches high. All-steel construction, angle and sheet steel. Olive green lacquer finish. Shipped K.D.

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**Angle Steel Equipment**

Permanence in Steel

ECONOMICAL • SANITARY • DURABLE

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Plainwell, Mich.

☐ Send Representative
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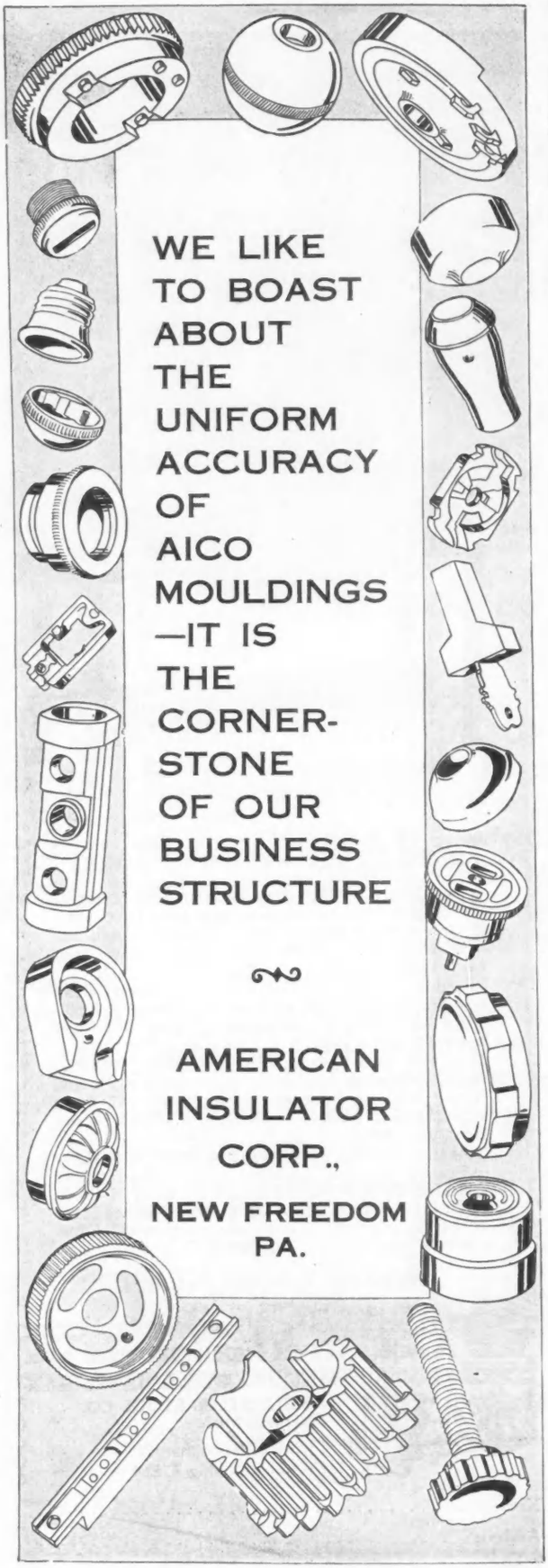


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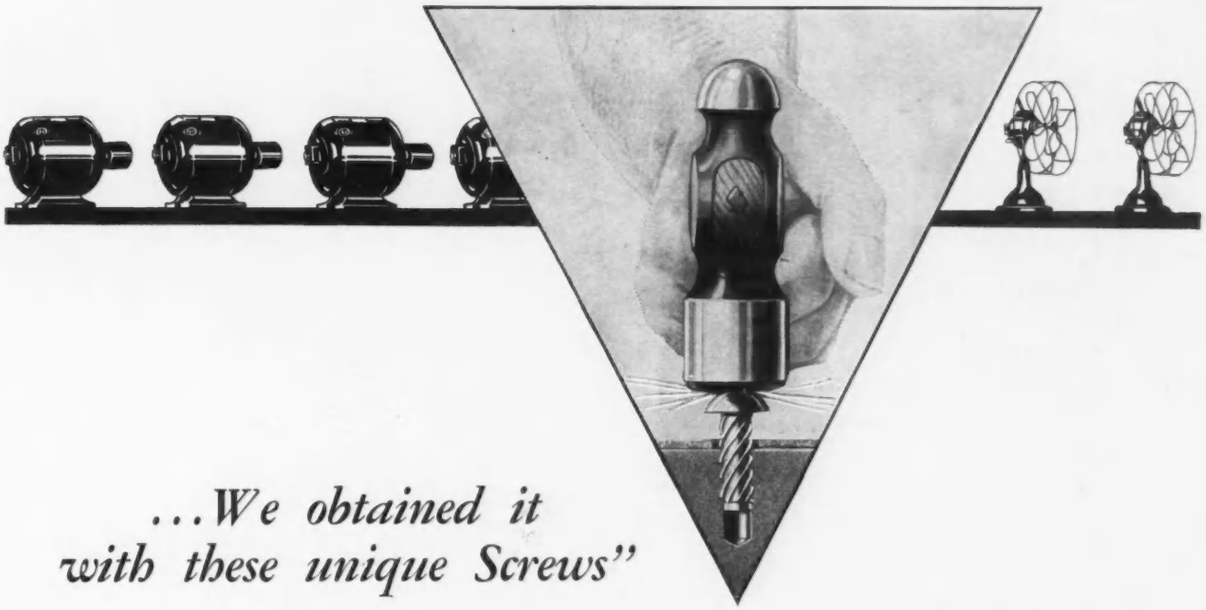
Electrical Manufacturing

*Robbins & Myers say:*

# "We wanted a fastening that would be permanent



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Escutcheon pins proved unsatisfactory as a means of fastening the plates. Not only did they fail to hold, but they were also difficult to handle. Robbins & Myers overcame these troubles simply by adopting Hardened Metallic Drive Screws for the purpose.

20,000 manufacturers of electrical and mechanical devices of every description use these unique Screws advantageously wherever secure fastenings to iron, brass and aluminum castings, steel, Bakelite, etc., are required. Applications range from name plates to fastenings where great holding power is required.

Surveys recently made by a firm of independent engineers show how Hardened Metallic Drive Screws have saved thousands of dollars a year in time and labor on some applications . . . how they have improved design, speeded up production or afforded greater security on others.

We want you to try this unique Screw that taps its own thread and holds better than a machine screw —even under vibration. Tell us what you want to fasten—we'll send proper samples for a test on your own work.

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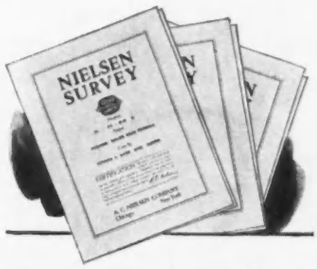


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